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STUDY BEHAVIOUR CORRELATES OF COGNITIVE COMPLEXITY: A MATCHING MODEL APPROACH TO INDEPENDENT STUDY

by

© JOHN STOTEN

A THESIS

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FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled STUDY BEHAVIOUR CORRELATES OF COGNITIVE COMPLEXITY: A MATCHING MODEL APPROACH TO INDEPENDENT STUDY submitted by JOHN STOTEN in partial fulfilment of the requirements for the degree of Master of Education in Educational Psychology.

.....
Supervisor

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Date May 2, 1975

TO MONIKA

She knows why.

ABSTRACT

This study is an exploratory investigation of the aptness of an educational treatment-student matching model (Hunt, 1971) to study behaviour research. In addition, this study investigates the model's characterization of independent study environments and those students who opt for them.

The study sample comprised 52 Albertan open university students enrolled in an introductory social science course at Athabasca University. Each subject was administered the Paragraph Completion Test (Schroder et al., 1967) as a measure of student conceptual level, a study behaviour questionnaire, an instructional preferences questionnaire, and a reading comprehension test. Correlations were obtained between student conceptual level and student responses to items on each of the two questionnaires. Reading test scores were employed as a control for reading ability.

The obtained correlations indicate support for the aptness of Hunt's model to study behaviour, particularly with respect to such study behaviour areas as; intrinsic academic motivation, reactions to the demands of course work, reactions to academic tests, and rote-learning strategies. Tentative support is also indicated for the preferential aspects of Hunt's model. However, the presence of a majority of low conceptual level students in the study sample indicates a need for further examination and qualification of the model's characterization of independent learning environments and those students choosing them.

The implications of the above findings are discussed in the context of open university learning systems.

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CHAPTER 1

INTRODUCTION TO THE STUDY

The present study was designed to investigate the aptness of an educational matching model, proposed by Hunt (1971), to study behaviour research. This study is therefore an attempt to relate two fields of educational research; treatment-student matching and student study behaviours.

BACKGROUND TO THE STUDY

Hunt (1971) has proposed that the personality construct of conceptual, or cognitive, complexity be used as the basis of an interactive educational treatment-student matching model. He has pointed to "the failure to take seriously the implications of an interactive model that coordinates the effects of educational environments upon particular types of students to produce specific objectives" (Hunt, 1971:1), and proposes his model as a means of representing the student's cognitive functioning and the educational environment along comparable dimensions. Once such representation has been achieved, then the aptness of the person-environment match for a particular set of educational objectives can be more readily ascertained.

Research on the utility of Hunt's model has been primarily in the context of traditional teaching institutions, both grade school and university (Hunt, 1971; 1974; Hunt et al., 1972), and as a result the prime emphasis has been on the differential effects of various teaching

styles. Where independent study has been considered, it has typically been treated as a low-structured, flexible learning environment (Tuckman and Orefice, 1973), and little emphasis has been made to discriminate additional dimensions of either the instructional format or students preferring this mode of instruction.

Student study behaviours have been widely studied in both school and university settings. The most prevalent method of collecting study habit data has been the use of a self-report inventory, which typically includes items concerning both actual study behaviours and attitudes toward academic work, and is scored according to prepared scoring keys (Brown and Holtzman, 1955). Attempts to achieve a direct link between study behaviours and scholastic achievement have resulted in conflicting evidence (Goldman and Hudson, 1973; Godfried and D'Zurilla 1973), and it appears that student academic performance derives from complex behaviour-task-personality interactions (Biggs, 1970(a)). In general it appears that no one method of study can be deemed optimal for all types of students, and that adequate assessment of the instructional requirements of an individual student requires a research framework that accounts for both student and task variables.

In summary, the results of study behaviour research to date indicate a need for an organizing theoretical model. Hunt has proposed an educational model which has been found useful in traditional teaching-learning situations, and which appears potentially useful as a theoretical model for study behaviour research.

THE STUDY

The aptness of Hunt's model to study behaviour research was investigated by comparing level of student conceptual complexity, the central construct of Hunt's model, with student responses to study behaviour questionnaire items.

For the purposes of this study, a sample of open university students from Athabasca University, Alberta, was used. This population was selected as open university students depend almost entirely upon self-instruction, using learning materials received by mail. Such an educational system requires an organizing model which facilitates the development and evaluation of learning materials capable of accommodating significant individual differences in learner study behaviours. The present investigation is therefore of direct relevance to the above educational setting.

Subjects were administered the Paragraph Completion Test (Schroder et al., 1967), a study behaviour questionnaire, an instructional preference questionnaire and a reading comprehension test. Correlations were then calculated between student conceptual complexity scores, as measured by the Paragraph Completion Test, and item scores on the study behaviour and instructional preferences questionnaires. Reading comprehension scores were used as a control for reading ability. The results are discussed in terms of Hunt's model and the open university context.

CHAPTER 2

REVIEW OF THE LITERATURE

PART 1: THE COGNITIVE COMPLEXITY MODEL

Current cognitive complexity theory derives from a broad field of psychological theory. It draws upon cognitive (Lewin, 1935) neo-behaviourist (Hebb, 1949) and developmental (Piaget, 1954) interpretations of human behaviour. In particular, its formulation has been strongly influenced by past treatments of concept formation, such as those of Goldstein and Scheerer (1941) and Murphy (1947).

Kelly (1955) developed a theory of personal constructs as a model to illustrate the central role of concepts in determining an individual's perception of, and reaction to, his social environment. Bieri (1955), following Kelly's model, developed a theory of cognitive complexity and utilized Kelly's Role Construct Repertory Test as a measure of this concept. Bieri's concept of cognitive complexity is based upon the degree of differentiation of an individual's construct system with respect to social stimuli.

> The cognitively complex person is assumed to have available a greater number of personal constructs to construe the behaviour of others, while the cognitively simple person has available relatively few personal constructs (Bieri, 1961:359).

Thus complexity increases with increased differentiation.

Harvey, Hunt and Schroder (1961) have utilized Bieri's concept of cognitive complexity in attempting a comprehensive theory of personality based upon conceptual systems. Both degree of differentiation

and integrative complexity are central to this model, with more emphasis upon the latter. The model is a developmental one and emphasizes the interactive nature of cognitive development. In this respect it echoes the positions of Piaget and Werner.

Harvey et al. propose that cognitive development proceeds through stages from a relatively undifferentiated, simply integrated, concrete state to a highly differentiated, integratively complex and abstract state. This concept is not new and occupies a central position in several developmental theories such as Murphy (1947), Piaget (1954), and Werner (1957).

Piaget (1954) describes the development of thought through the interdependent processes of assimilation and accommodation. These processes are viewed as the two poles of organism-environment interaction. Thus, assimilation and accommodation are opposing processes whose joint activity results in a tendency toward a dynamic equilibrium. This equilibrium is never fully achieved and thus intellectual development proceeds through further assimilative and accommodative activity.

If the term "concept" is substituted for "thought" in Piaget's model of cognitive development, the above can be translated into conceptual systems terminology as follows. Assimilation is the incorporation of environmental factors into the existing conceptual framework, and accommodation is the modification of that framework as a result of environmental effects. According to Harvey et al., equilibrium between assimilation and accommodation is effected through the process of differentiation-integration.

> Differentiation refers to the breaking of a novel, more undifferentiated, situation into more clearly defined and articulated parts. Integration is the relating or hooking of such parts to each other and to previous conceptual standards (Harvey, et al., 1961:18).

Although these appear to be points of general correspondence between Piaget's and Harvey et al's. models of cognitive development, there are inconsistencies at a more particular level. For example there is strong agreement on the function of differentiation but a direct Piagetian equivalent of integration is harder to find, its function being implied rather than explicitly stated.

Harvey et al. consider that differentiation can occur without integration but that integration is necessary for development to proceed along the concrete-abstract dimension. There is therefore agreement with Werner's orthogenetic approach which characterizes mental development as a process of increasing differentiation accompanied by increased hierarchic integration. However, Werner sees differentiation and integration as complementary functions whereas Harvey et al. treat them as at least partially independent.

All of the above three models view development as proceeding in a somewhat cyclical fashion with development at one stage paralleling development at an earlier stage. However, Harvey et al. stress progression within and between these "cycles" as proceeding saccadically rather than at a fairly uniform rate.

Harvey et al. do not view differentiation-integration as proceeding through stages, rather

> . . . differentiation-integration is a process through which concepts develop and a means by which the concepts attain some level on the dimension of concreteness-abstractness. It is the levels of concreteness-abstractness at which concepts may be placed to which we propose to apply the term stages and not to differentiation-integration as such (Harvey, et al., 1961:22).

Conceptual systems theory echoes Murphy's (1947) position that concreteness-abstractness is a continuum and not a series of discrete demarcations, as has been proposed by Goldstein and Scheerer (1941). However, Harvey et al. do concur with the latter in defining concreteness-abstractness as a quality of the subject-object relationships developed by an individual. Individual differences along the concrete-abstract continuum are therefore viewed as differences in magnitude and not quality.

Harvey et al. propose four nodal stages of conceptual development along the concrete-abstract dimension.

> Our use of the term "stage" in the present book refers to levels of cognitive functioning on what we assume to be a continuous dimension of concreteness-abstractness. . . . By a level we would want only to imply a range of behaviour within which the behavioural constancy showed less variability than between it and other groups of measurement (Harvey et al., 1961:24).

Harvey et al. propose that progression from one stage to the next, more abstract, stage is achieved through increased differentiation and reintegration of the more central concepts with respect to successive motivational "poles" of independence and dependence.

The lowest, or most concrete stage of development proposed by Harvey is that of "Unilateral Dependence" (Harvey et al., 1961). Individuals at this stage are characterized as externally directed. They adhere to social norms and external authority and tend to structure the environment in absolutes; judgments being of the either-or, black-white nature.

The next stage, in ascending order of abstractness, is that of "Negative Independence." Individuals at this stage are capable of distinguishing between external and internal criteria. Orientation

is toward rejection of, and opposition to, external authority and social standards and can be crudely typed as anti-social.

The third stage of abstraction is that of "Conditional Dependence and Mutality." Individuals at this stage are capable of objectivity and are characterized by an empirical approach toward subject-object relationships. Such individuals are pro-social and sensitive to social control by and of themselves.

The fourth, and most abstract, stage of development is that of "Interdependence." Individuals at this stage are characterized as highly abstract. They are highly sensitive to their environment and yet retain autonomous standards. These individuals are primarily motivated by intrinsic rewards, and intrinsic satisfaction is obtained through information-seeking and problem-solving activities.

It should be noted that a person does not necessarily reach the same level of abstractness in all areas of development. However, the more integrated the self-system (i.e., the totality of an individual's concepts) becomes, the more concepts functioning at the same level of abstractness, especially those most central to the total self-system.

The conceptual systems model was intended to be a comprehensive model of personality organization and attempted to treat both structure and content. Nevertheless, the main emphasis was upon system-specific content, that is, motivation. Derivative treatments have focussed upon narrower aspects of personality organization and can be broadly divided with respect to their relative emphasis upon content or structural aspects. Harvey (1967) has retained the original model's four discrete developmental stages and has examined motivational and other content characteristics of each stage.

In contrast to Harvey, Schroder has focussed upon the structural aspects of conceptual systems theory (Schroder et al., 1967; Schroder, 1971)...

> The focus is not upon the content of the information used; rather it is on the number and connectedness of conceptual or integrating rules used for organising such information in thinking, judging, and valuing (Schroder, 1971:240).

The number and connectedness of combinatory conceptual rules define the level of integrative complexity of an individual's conceptual structure. Schroder thus emphasizes integrative complexity as the basic personality variable, and is concerned with information processing characteristics at different levels of integrative complexity. Schroder assumes that increased integrative complexity is normally accompanied by increased differentiation or dimensionality, but that this rule does not always apply. For example, an individual's conceptual system may be highly differentiated and yet be organized in a rigid, hierarchical manner; that is, simply integrated. However, the reverse, although theoretically possible, would appear most unlikely; as a high degree of dimensionality would appear to be necessary for a highly complex integrative structure to evolve.

The original conceptual systems model is followed insofar as development is viewed as progressing from concrete to more abstract conceptual structures along a continuous concrete-abstract continuum. However, Schroder has greatly de-emphasized the stage aspect of development along this continuum and the four levels of complexity discussed are regarded as "merely points on a somewhat continuous dimension which have been selected solely for purposes of communication" (Schroder et al., 1967:15).

The lowest level of integrative complexity is characterized by compartmentalization and rigid hierarchical integration. Individuals at this level typically exhibit categorical, black-white judgments, and information is either simply categorized or rejected. Thus, there is a minimum of conceptual "conflict." Owing to the absoluteness of categories there is little internal direction and thus behaviour is externally directed. In addition, rules are overgeneralized and can change abruptly according to the situation.

At a moderately low level of integrative complexity an individual is able to generate alternate rule structures. These alternate organizations remain compartmentalized and unrelated at this level, but do provide for an element of uncertainty and choice. This element of uncertainty and choice leads to instability of judgmental behaviour and an apparent degree of "negativism." Judgments at this level are less absolute and the element of choice available provides for a minor degree of internal control.

At a moderately high level of integrative complexity more complex rules are available for relating and comparing information. Alternate rule organizations can be compared and related at this level. Decision-making becomes relativistic and empirical as opposed to deterministic, and alternate perspectives can be evaluated simultaneously. Choice is a significant factor at this level and there is a marked differentiation between self and the environment.

At high levels of integrative complexity alternate rule structures are highly differentiated and related in a complex manner. The most important characteristic of functioning at this complexity level is the ability to formulate theoretical rules. Thus, rule

systems are available which enable the individual to generate information without the provision of additional external information. That is, he can "go beyond the data given," both physically and temporally.

There is strong similarity, in terms of structural organization, between the original conceptual systems theory stages and Schroder's levels. The major difference, as stated earlier, is that Schroder has de-emphasized the motivational characteristics of each level and omitted the original model's emphasis upon development resulting from the successive influence of motivational poles. Instead, Schroder stresses an inductive interdependent environment as necessary to the development of increased integrative complexity at all levels of cognitive development. The development of conceptual organizing structures is therefore viewed as dependent upon the general type of environment as opposed to more particular traditional learning variables such as reinforcement, punishment, and social imitation.

It is useful at this point to consider the relationship between Schroder's conceptual complexity construct and similar personality constructs. Schroder has developed a semi-projective test, the Paragraph Completion Test (PCT) (Schroder et al., 1967) to "assess levels of integrative complexity in the 'interpersonal uncertainty' domain" (Schroder, 1971:257). The PCT appears to be a valid and reliable measure of conceptual complexity (Gardiner and Schroder, 1972) and is discussed more fully in Chapter 4.

Schroder's construct appears similar in many respects to previous treatments of structural rigidity and flexibility. Notable antecedents are; Frenkel-Brunswick's treatment of intolerance of ambiguity (1949), Adorno et al's. development of the F test as a

measure of authoritarian rigidity (1950), and Rokeach's development of the Dogmatism Scale (1960). In the following discussion it should be borne in mind that all personality measures are content specific to some extent. This includes measures that purport to measure solely structural properties, such as the PCT. Thus, high correlations are unlikely to be obtained.

Although Adorno et al's. description of the authoritarian personality appears very similar to that of an integratively simple individual, the two measures in fact bear an inverted "U"-shaped relationship. Simply structured individuals score both high and low on the F test, whereas complex individuals score in the mid-range or lower end. Nevertheless, the two measures have provided overall correlations in the -.25 to -.55 range (Schroder et al., 1967). The above curvilinear relationship between the two measures appears to derive primarily from the content bias of the F scale, which samples such domains as morality, ethnic relations and politics.

Rokeach intended the Dogmatism Scale as a more refined measure of structural properties than the F test. The Dogmatism Scale would therefore be expected to provide higher correlations with conceptual complexity than the F test. However, correlations obtained between conceptual complexity and dogmatism have been lower than those obtained between the former and authoritarianism. There appears to be significant content bias in the Dogmatism Scale, and the construct validity of this measure has been questioned (Schroder et al., 1967).

Other constructs that appear similar to Schroder's are Piaget's treatment of moral development (Piaget, 1932) and Rotter's treatment of internal control as a central personality variable (Rotter, 1966).

Piaget is primarily concerned with structural properties in his treatment of moral development. He characterizes moral development as proceeding from an externally directed, absolute approach to an interdependent, relativistic approach to moral rules. Kohlberg (1966), following Piaget's model, has developed a Moral Maturity Scale which would be expected to correlate positively with conceptual complexity. This assumption is borne out by Sullivan et al's. (1970) study in which an overall correlation of 0.34 was obtained between Kohlberg's Scale and conceptual complexity.

Rotter's (1966) construct of internal control would also be expected to correlate positively with conceptual complexity, as increased self-direction results from greater integrative complexity. However, the two measures do not appear to relate as well as might be theoretically expected, with correlations of the order of 0.12 being obtained (Hunt et al., 1968).

There is relatively little solid evidence for the developmental validity of Schroder's model. Most complexity studies have been correlational or cross-sectional and have provided significant but slight correlations between age or grade level and level of conceptual complexity (Hunt, 1964; Hunt et al., 1968). There has been scant longitudinal research, but Hunt (1968) has observed a significant increase in the complexity scores of a sample of male adolescents over a period of four years. However, all the above studies are flawed in that environmental effects were not accounted for. Such effects are critical to the development of complexity. This flaw is also evident in studies investigating such factors as social class (Hunt and Dopyera, 1966) where mixed results have been obtained. This study did

indicate however, that sex may be a significant variable.

The present investigation is primarily concerned with educational variables. It is useful, therefore, to consider the relationship of conceptual complexity to potentially relevant variables in this domain. There appears to be a low positive correlation between intelligence and conceptual complexity. For relatively heterogeneous groups correlations are of the order of 0.20 whereas in relatively homogeneous groups, such as college students, correlations are generally positive and insignificant (Hunt, 1971).

The relationship between conceptual complexity and academic achievement is not a simple one. Typically, low positive correlations have been observed (Hunt et al., 1968). However, further analysis indicates that course content is a critical factor; for when faculty differences are taken into account, correlations may vary from -.56 to 0.44 (Pohl and Pervin, 1968). These findings are further substantiated by findings indicating that task criterion complexity is an important factor in comparing achievement levels with conceptual complexity (Claunch, 1964).

The above discussion of complexity constructs serves to introduce Hunt's educational treatment model, which appears to occupy a middle ground between the current theoretical positions of Harvey and Schroder. Hunt echoes Schroder's position with respect to the structural aspects of conceptual organization and development and has adopted Schroder's measure for this construct, the PCT. Hunt has also attempted to treat motivational aspects of conceptual complexity and has retained the developmental stages of the original conceptual systems model, albeit in a less definitive form.

> This CL model views personality organization on a continuous dimension, with very general anchor points (Hunt, 1971:36).

Hunt has added a very low level stage, Sub. I, and questioned the utility of the original model's stages III and IV. It should be noted, however, that Hunt's research has typically involved subjects of 18 years of age or under, and that this difference in findings may well derive solely from age differences between samples (Hunt, 1971).

The present investigation is primarily concerned with Hunt's use of the personality construct of conceptual complexity in an interactive educational treatment model, and his particular theoretical complexity model has not been adopted. For the purposes of this study, Schroder's complexity model has been adopted. The latter construct is considered to have been better validated than Hunt's in the literature (Gardiner, 1968; Stewin, 1969) and is considered more appropriate to the design of the present study, which treats complexity as a continuous dimension.

Hunt's major concern is the provision of a learner-educational environment match. In very general terms, matching models may be classified according to their relative emphasis upon long-term developmental or short-term behavioural changes. Obviously, the two approaches are not completely at odds, for treatments primarily concerned with short-term changes can also involve developmental changes. A complexity level model can be utilized for both types of matching. If immediate student satisfaction and short-term educational goals are emphasized, then the educational environment is considered optimal when congruent with learner characteristics. If the goal is a developmental one; for example, increased learner complexity, then some degree of mismatch

or learner-environment disequilibrium is necessary (Hunt, 1971).

Hunt's model is essentially an interactive one and therefore the individual and the environment must be described along comparable dimensions. Hunt proposes that the person and the environment be described in terms of structure. The person's conceptual structure is described in terms of conceptual complexity or, to use Hunt's terminology, conceptual level (CL). An individual's CL is considered an indication of his need for compensatory environmental structure.

> Thus the heart of the CL matching model is a generally inverse relation between CL and degree of structure: Low CL learners profiting more from high structure and high CL learners profiting more from low structure, or in some cases, being less affected by variations in structure. (Hunt, 1971:66).

Thus, although expectations for low complexity students are well defined, the prediction of high complex student behaviours is somewhat ambiguous.

Hunt defines a highly structured environment as one which is largely controlled by the training agent and in which the learner is allowed little opportunity to determine the training conditions. The following are considered to be examples of high structure; lecture presentation, organized study, and a rule-example instructional format. These treatments are considered to be teacher-centred approaches (Hunt, 1971). Such environments are termed unilateral by Schroder (1971). In contrast, a low structure environment is defined as one in which the learner is given at least an equal opportunity to determine the training conditions. Examples of low structure are; discovery learning, independent study, and an example only instructional format. These treatments are considered to be learner-centred approaches (Hunt, 1971). Such environments are termed interdependent by Schroder (1971).

Hunt thus describes structure in terms of general rather than specific dimensions and this contrasts markedly with Schroder's emphasis upon multiple specific dimensions in describing environmental complexity (Schroder et al., 1967). Hunt recognizes this potential weakness in environmental descriptions and he emphasizes the need for careful consideration of the relative size and immediacy of effect of the environmental units employed in any study. He suggests that the environment be broken down into structural units which are then ordered from the large and remote to the small and immediate (See Table 1). This procedure provides for a more complete assessment of environmental structure, albeit at a rather gross level. Hunt also stresses, however, that any description of an educational environment is of necessity a relative one owing to the complexity of such an environment (Hunt and Sullivan, 1973).

Table 1

Taxonomy of Educational Environments*

Environmental Unit	Unit Size	Immediacy of Effect
Cultural setting	Large	Remote
School setting (e.g., locale)		
School (classroom) characteristics (size, etc.)		
School (classroom) organizations (social and power)		
Teacher personality (general)		
Teacher attitude (to role and students)		
Teacher behaviour (teaching)	Small	Immediate

* Source: Hunt and Sullivan, 1973:90.

As mentioned earlier, Hunt's prediction of the behaviour of high CL individuals is ambiguous. This ambiguity is well illustrated by the findings of two studies. McLachlan and Hunt (1973), using learner integration of presented information as the performance criterion, found that low CL learners performed significantly higher with a high structure lecture treatment than with a low structure discovery approach. However, high CL learners were unaffected by the treatment method. Tomlinson and Hunt (1971), using a combination of several performance criteria, found that high CL learners performed significantly better than low CL learners with the low and intermediate structured presentation formats of example and example-rule respectively. However, with the high structure rule-example format there was a decrement in the performance of high CL learners and an increment in the performance of low CL learners. The results of this study tend to support a preferential matching model for high CL learners whereas the results of the former study tend to support a compensatory model.

Snow (1969) has suggested a compensatory model and a preferential model in his discussion of aptitude-treatment interactions (ATI) and it is likely that both models require consideration for matching. A possible explanation is that as the need for a compensatory environment decreases, preferential factors become increasingly potent. This view appears to be supported by Tuckman's (1968) findings that high CL learners preferred non-directive to directive teachers.

Notwithstanding the apparent ambiguity with respect to compensatory and preferential effects, Hunt's basic model appears reasonably well substantiated by empirical evidence (Hunt, 1971; Hunt, 1974; Hunt et al., 1972; Hunt et al., 1974). The more recent work of Hunt and

his colleagues has emphasized a more general approach to matching through a meta theory based upon Lewin's B-P-E paradigm (Lewin, 1935). This later work has centered upon a more precise definition of treatment models and expanded descriptions of the person in terms of accessibility channels (Hunt, 1974; Hunt et al., 1974).

Conceptual level is described as a learning style, or cognitive orientation, toward environmental structure, and is treated as one characteristic or accessibility channel of the learner. In addition, other accessibility channels such as; motivational orientation, value orientation and sensory orientation are considered. The degree to which motivation and value orientation can be considered separately from conceptual level is questionable. Both of these learner characteristics may be considered to be subsumed to some extent by such conceptual level characteristics as orientation toward intrinsic or extrinsic motivation, and latitude of acceptance of new values. The inclusion of sensory orientation appears a useful one and the consideration of preferences for, or greater information accessibility through, a particular sensory modality appears to be a necessary one (Siegel, 1973).

PART 2: STUDY BEHAVIOUR RESEARCH

The present study is concerned with an open university student population. Instructor direction is kept to a minimum and an emphasis is placed upon self-directed learning on the part of the student, who is free to progress in his own manner and at his own speed. Thus the efficacy of an individual student's study behaviours are probably of great importance in determining that student's academic progress.

The relationship between study behaviour and university achievement has been widely investigated. It has been a common assumption that the two are clearly related, and that certain study habits or strategies are optimal for all students (Pauk, 1962; Robinson, 1970). However, the available evidence does not provide clear support for such an assumption. Although several studies have indeed found a significant relationship between study habits and college achievement (Brown, 1964; Frost, 1965; Goldman and Hudson, 1973), several others have failed to establish such a relationship (Ahmann and Glock, 1957; Anderson and Kuntz, 1959; Goldfried and D'Zurilla, 1973). The issue is further complicated by evidence that suggests that so-called "good" study habits are significantly more common amongst the worst performing students (Maddox, 1963).

Study behaviour data is commonly obtained by means of a questionnaire; usually one of the several available standardized inventories, such as the Survey of Study Habits and Attitudes (SSHA) (Brown and Holtzman, 1955). The SSHA is typical in that it includes items concerning both study behaviour and academic attitudes, which are scored according to a standardized scoring key. The total score is derived from two scores; a study behaviour score and an academic attitudes score. Thus certain study behaviours and attitudes are considered optimal for all students and it is further assumed that study behaviours and academic attitudes are related on a simple good-bad dimension.

There is evidence that such a priori categorization of study behaviours and academic attitudes is intuitive rather than substantive and that more reliable and valid descriptions of study behaviours and

attitudes are obtained empirically (Braun, 1970). Thus it is possible that the conflicting evidence obtained to date may derive partly from the nature of the research tool employed to obtain study behaviour data.

It would appear that both study behaviours and academic attitudes contribute to academic achievement, and there is some evidence that attitudinal and motivational factors provide a more significant prediction of academic achievement than study habits (Finger and Schlesser, 1965). Lavin (1965) has suggested that study behaviours and academic attitudes contribute independently to the prediction of academic achievement. However, one trend in more recent research has been to assume the reverse. That is, study behaviours and attitudes are considered as related to one another and are both largely determined by fairly stable personality traits.

Several studies have found introverts to be more successful than extraverts at university (Lavin, 1965; Estabrook and Sommer, 1966). Introverts have been found to report "better" study methods and to exhibit higher academic motivation than extraverts (Entwhistle and Wilson, 1970), and stable introverts have been described as high achievers with "good" study habits (Entwhistle and Entwhistle, 1970). Thus, there appears to be substantive evidence that personality variables are related to academic success, academic attitudes and study behaviour.

Several studies have also found personality differences between faculties (Brown and Dubois, 1964; Biggs, 1970(b)). Bigg's study is worthy of note as he isolated several "learning style" factors related to personality functioning. Although low correlations were obtained, they do lend credibility to the hypothesis that study strategies reflect

more central personality variables. Biggs found the effectiveness of study strategies moderated by faculty differences and that two different strategies were capable of contributing to academic success; a low level reproductive strategy and a high level transformational strategy. These two strategies have been found to be correlated with extreme response set, introversion-extraversion, convergence-divergence and dogmatism (Biggs and Das, 1973).

Recent research into faculty differences in study behaviour also serves to illustrate that the controversy concerning universally optimal study behaviours is not yet dead. For example, Goldman and his colleagues (Goldman and Hudson, 1973; Goldman and Warren, 1973) have continued to find that certain study behaviours are optimal, regardless of faculty. In contrast, other studies have found that the effectiveness of study behaviours depends significantly upon the type of faculty (Biggs, 1970(a)). Nevertheless, there is a large measure of agreement between such studies, for Goldman and Hudson found a significant relationship between study behaviours and faculty in addition to their main findings. Also, Biggs has pointed to the possibility that differences in findings such as those mentioned above may derive from intervening factors such as institutional variables or sex (Biggs, 1973(b)).

Although several studies have investigated the relationship between field of study and study behaviour, little attention has been paid to the possible effects of different modes of evaluation upon study behaviour. However, two studies are worthy of note. Hakstian (1971) found that the mode of evaluation does not affect students' study behaviours and that students perform equally well on essay and

objective tests. These findings contrast with those of Biggs (1973(a)) who found that success on objective tests is related to study strategies indicative of a convergent learning style, and that several study strategies appear related to performance on an essay-type test.

The above summary of study behaviour research findings indicates that the majority of such research has been primarily concerned with identifying correlates of general academic achievement. Emphasis has been placed upon identifying simple main effects with little consideration given to the mediating effects of person-environment interactions.

The early emphasis of study behaviour research upon simple main effects echoed the then generally prevailing approach to psychological research. Dissatisfaction has been expressed with the arbitrary division of research between general and environmental effects and individual differences, and a broader interactive approach has been proposed (Cronbach, 1967). More recently there has been increased attention to such an approach both in general psychological research and study behaviour research. Recent interactive study behaviour research has evidenced concern with faculty differences (Goldman and Warren, 1973), personality differences (Entwhistle and Wilson, 1970), and evaluation format (Biggs, 1973(a)). In addition, a few studies have investigated both personological and faculty differences (Biggs, 1970(b)). Although such research has been concerned with interaction, the research design has not been based upon a specific theoretical interactive model.

Cronbach (1967) has proposed an aptitude-treatment interaction model (ATI) in which both educational treatments and student aptitudes are specified. An aptitude in this context is any characteristic or

group of characteristics that is associated with students whose academic performance either improves or deteriorates under a given treatment. To date, ATI research has provided little substantive evidence (Bracht, 1970; Goldberg, 1969) and few study behaviour investigations have utilized this model (Richmond, 1972; Biggs, 1973(b)). These latter studies have indicated the presence of limited ATI effects and it would appear that unidimensional rather than multidimensional aptitudes are applicable to the ATI model.

The relative lack of ATI effects in the literature does not invalidate the interactive approach. ATI is but one way of construing interaction, and is of limited use in that interaction is forced to conform to a statistical procedure (Hunt, 1974). When study habit research is reviewed according to a broad theoretical model of interaction such as Lewin's B-P-E paradigm, evidence of person-environment interactions can be discerned, as noted earlier. However, it is virtually impossible to obtain an effective comparison of findings owing to the diversity of criteria employed. In particular, there is a diverse mix of personological variables, varying from those derived from personality theory, such as introversion-extraversion, (Entwhistle and Wilson, 1970) to those roughly describable as learning styles (Biggs, 1970(b)).

There is a need for a theoretical model for study behaviour research by which both the person and the environment may be described in commensurate terms. Above all, there is a need for such a model to utilize dimensions of the person and the environment that bear directly upon educational practice. That is, the model must have direct relevance for education. Hunt (1971) has proposed such a model and

the suitability of this model for study behaviour research is discussed in the succeeding section.

PART 3: INTEGRATION

In the first section of this chapter, the personality construct of conceptual complexity was described and its historical development summarized. Hunt's use of this variable as a basis for his conceptual level matching model, an interactive educational treatment model, was then discussed. In the second section of this chapter, study behaviour research was summarized. The generally piecemeal nature of such research was commented upon and the need for an appropriate organizing theoretical model was stressed.

As stated earlier, Hunt has adopted Lewin's B-P-E paradigm as the general model for his particular educational matching model. The need to employ such a paradigm has been expressed in the area of study behaviour research (Biggs, 1973(b)). In very general terms, therefore, Hunt's model appears to be a suitable one for study behaviour research.

Study behaviour research is essentially concerned with student learning behaviours in an independent, or uncontrolled, educational environment. Conceptual complexity research has paid relatively little attention to independent study environments, the latter being broadly categorized as appropriate for high CL students. Although complexity research has typically been concerned with the differential effects of various teaching models, a few studies have included student-directed learning as part of the research design (Hunt et al., 1974; Tuckman and Orefice, 1973). Theoretically, high CL students would be expected to prefer an uncontrolled or independent study environment and low CL

students would be expected to avoid such an option. However, the empirical evidence is equivocal on this matter (Tuckman and Orefice, 1973). A preliminary concern for this investigation therefore, is the distribution of the chosen open university population with respect to CL.

As stated above, Hunt and his colleagues have tended to concentrate upon treatment models. Thus, relatively scant attention has been paid to reciprocal student-initiated effects. Hunt notes that high CL students have been observed to "pull" higher level information statements from their teachers (Hunt, 1974), and he has stressed the need to consider such "student pull" in an interactive educational research design (Hunt and Sullivan, 1973; Hunt, 1974).

Of more direct relevance to the present study is the finding of Hunt et al., (1974) that students are capable of providing the appropriate environmental structure for themselves. Hunt et al. provided homogeneous groups of low and high CL students with the same instructional model and no teacher. The low CL groups elected their own "teachers" and relied heavily upon the structure provided by the instructional model. In contrast, the high CL groups worked more as a committee and relied significantly less upon the instructional model, utilizing the latter only where it was considered functional for the presented task.

The above evidence indicates that students are capable of providing an appropriately structured learning environment for themselves. If such is the case, then students differing in conceptual level would be expected to report different behaviours when presented with the same educational treatment. Therefore, the central concern

of this investigation is the relationship between student conceptual level and study behaviour.

Hunt has emphasized the importance of an adequate structural description of the educational environment and has suggested that both objective and subjective, or learner, perceptions of that environment be considered (Hunt and Sullivan, 1973). Athabasca University presents itself as a decentralized organization open to all students regardless of their formal educational background. Optional student services such as free tutoring by telephone and small discussion groups are also offered. Thus, at a macro or remote level the educational environment, or "climate," can be viewed as minimally structured with an emphasis upon student autonomy. At a less general level, students are free to complete course work at their own speed and to use course materials in any manner they wish. Again the environment may be described as unstructured and providing for individual autonomy.

At the most immediate level, that of the structure provided by the instructional "package," the presented environment is somewhat ambiguous. The package is highly structured in that the student is provided with step-by-step instructions on the use of the supplied audio-tapes and workbook. However, the content is presented in neither a strictly rule-example nor example-rule format. Thus the manner of presentation may best be described as of moderately high structure. In order that students' perceptions of the instructional structure may be assessed, the relationship between a student's conceptual level and his perception of the instructional environment will be examined.

CHAPTER 3

DEFINITIONS AND HYPOTHESES

STUDY DEFINITIONS

The following definitions were adopted for use throughout this study.

Differentiation

This construct refers to the number of functionally unique information categories perceived by an individual in a given stimulus domain.

> Differentiation or the number of different kinds of information perceived refers to different principles of stimulus ordering. . . . In the simplest case, differentiation may refer merely to a principle of assignment to a category (inclusion-exclusion). . . . At the other extreme, another person might be capable of making judgments in terms of a sophisticated ratio scale, making fine and reliable discriminations (between stimuli) (Schroder, 1971:243).

Integration

This construct refers to the manner and degree of an individual's organization of information, irrespective of the number of "bits" of information perceived. Thus, the concern is with an individual's conceptual rule structure.

> The number of such combinatory rules and the degree of connectedness between these rules define the integrative complexity of conceptual structure (Schroder, 1971:249).

A simple rule structure is considered to be of low integrative complexity, and a complex conceptual rule structure is considered to be of high integrative complexity.

Conceptual Complexity

This study utilizes Schroder's theoretical construct of conceptual complexity, which is based directly upon integrative complexity as the central personality variable. Thus,

> The number of different ways an individual learns to combine and relate a set of information items is referred to as the level of conceptual complexity (Schroder, 1971).

Conceptual complexity was measured by means of Schroder's semi-projective measure, the Paragraph Completion Test. A high score indicates an individual possessing a high level of conceptual complexity and vice versa.

Conceptual Level

This construct was adopted as the operational definition of Schroder's construct of conceptual complexity, and was developed by Hunt (1971). Whereas Schroder's construct accents information processing characteristics, Hunt's adaptation emphasizes the need or preference for environmental structure associated with varying levels of conceptual complexity. Although Hunt developed a slightly different version of the PCT from Schroder, the original version of the PCT (Schroder et al., 1967) was adopted for the purposes of the present study. A low PCT score indicates a low CL individual with a need or preference for high environmental structure, and a high PCT score indicates a high CL individual with a need or preference for low environmental structure. Conceptual level can thus be considered as a learning style (Hunt, 1974).

Environmental Structure

This term refers to the degree of conceptual organization provided for the student by the educational environment. Thus, a highly structured environment is one that provides for little self-directedness on the part of the student whereas a low-structured environment provides for much individual autonomy.

STUDY HYPOTHESES

Main Hypothesis

The present study is primarily concerned with the relationship between student conceptual level and study behaviour. Recent research indicates that students differing in conceptual level would be expected to report different study behaviours. Therefore the assumption is that student study behaviour is related to student conceptual level. This assumption was tested by means of the following specific hypothesis:

H_1: There is no significant relationship between student CL, as measured by the PCT, and student responses to any item on a study behaviour questionnaire.

Subsidiary Hypotheses

In view of the apparent conflict between theoretical expectations and experimental evidence to date concerning the preference of low CL students for independent study environments, the number of such students in the chosen population is of concern to this study. This question was formulated as follows:

H_2: There is no difference in the frequencies of high and low CL students obtained in the chosen open university population.

Where a low CL student is defined as one obtaining a PCT score of four or less, and a high CL student as obtaining a PCT score of five or more.

Hunt (Hunt and Sullivan, 1973) has stressed the need for obtaining learner perceptions of the educational environment. He proposes that a student of low CL prefers, and reacts most favourably toward, a high degree of environmental structure and highly structured learning materials, and vice versa. Therefore the assumption is that a student's instructional preferences and reactions to the educational environment are related to that student's CL. This assumption was tested by means of the following specific hypothesis:

H_3: There is no significant relationship between student CL and student responses to any item on an instructional preferences questionnaire.

CHAPTER 4

EXPERIMENTAL PROCEDURE AND DESIGN

THE SAMPLE

For the purposes of this investigation, the total population of an Athabasca University introductory social science course was contacted. This population consisted of all freshman students enrolled in the above course between October 1, 1974 and November 13, 1974, and comprised 97 students. Of this number, 52 students responded by the end of the experimental period (February 28, 1975). However, a few students did not complete all the survey items, and therefore the applicable sample size is reported for each stage of the data analysis. A total of seven students formally withdrew from the course during the experimental period.

All students in the study sample were over 18 years of age and their academic qualifications varied widely, as Athabasca University does not require formal academic qualifications for entry. Sample characteristics are discussed more fully in Chapter 5.

STUDY PROCEDURE

All students were initially contacted by telephone or mail to ascertain their willingness to participate in this investigation. Owing to the wide dispersion of subjects over the Province of Alberta, it was found impractical to provide supervised testing sessions. Therefore, all tests and questionnaires were administered by mail.

All subjects received the following items: A study behaviour questionnaire (Appendix A), the Paragraph Completion Test (Appendix B), a reading comprehension test (Appendix C), and an instructional preferences questionnaire (Appendix D). The subjects received the above items when the third unit, or lesson, had been mailed to them. This procedure was adopted in order to ensure that students could gain some familiarity with the course format and materials and obtain some experience in self-study prior to completing the research forms. Students were instructed as to time limits for the Paragraph Completion Test and were asked to record the time taken to complete the reading comprehension test. All other items were untimed.

In order to gain further information as to student characteristics, student biographical data such as age and academic history were obtained from student records at Athabasca University. An attempt was made to gain further information concerning non-respondents through university records, personal correspondence and telephone calls. The investigation was terminated three months after the registration of the last student to be included in the sample.

THE INSTRUMENTS

Four research instruments were employed. One of them, the Instructional Preferences Questionnaire, was developed specifically for this study.

Study Behaviour Questionnaire

The questionnaire used in this study (see Appendix A) is an amended version of a study behaviour questionnaire first developed by

Biggs (1970(a)) using a sample of Australian university students. This particular questionnaire was adopted for use for two reasons: First, it has been demonstrated to reveal several factors that may be described as learning styles. It thus focusses upon educationally relevant personality variables as opposed to personality variables of a more general nature. Second, the more recent forms of this questionnaire have been validated upon an Albertan university population, thus providing for a more direct comparison of "open" and conventional Albertan university students.

Biggs has based his questionnaire upon an interactive learning model that characterizes academic performance as a derivative of a complex interaction of personality, motivational, and behavioural strategy variables (Biggs, 1970(a)). Study behaviour is thus viewed as

> . . . the translation, in the context of study, of certain enduring personality characteristics, into a series of operations or strategies (Biggs, 1970(a):163).

The original 72 item questionnaire was intended to tap such characteristics as intolerance of ambiguity (Frenkel-Brunswick, 1949), dogmatism (Rokeach, 1960), cognitive complexity (Schroder et al., 1967), convergence-divergence (Hudson, 1968), study organization, and intrinsic motivation. Factor analysis revealed six interpretable factors: Study Organization, Tolerance for Task Complexity, Cognitive Simplicity, Intrinsic Motivation, Encapsulation of Values, and Independence of Study Behaviour (Biggs, 1970(a); 1970(b)).

An adapted 80 item version of the questionnaire was developed, using a sample of Alberta University students (Biggs, 1973(a)). This adaptation included additional items relating to attitudes toward

university and course work. Seven empirical scales were obtained, and four a priori scales, based upon the original questionnaire scales, were added to provide two distinct categories of scales; value-motivational and study strategies.

The value-motivational category contained five scales. The Pragmatism, Class Orientation, Academic Interest, and Achievement-Organization scales were empirically derived, and the Academic Neuroticism scale was defined on an a priori basis. The study strategies category contained six scales. The Wide Reading, Simplifying, and Fact-Rote scales were empirically derived. The Scheduling, Dependence, and Relating scales were defined on an a priori basis.

On the basis of the above research, Biggs devised a new 102 item form of the study behaviour questionnaire, the SBQ-J. The SBQ-J samples ten study behaviour dimensions; each scale comprising approximately ten items. Scale titles and descriptions are shown in Table 2. The validity and reliability of the SBQ-J has been assessed in a further study (Biggs, 1973(b)), resulting in the removal of 22 items, all of which were newly added items on the SBQ-J.

For the purposes of the present study, the original SBQ-J was used as the basis for a study behaviour questionnaire (SBQ-JS). This version was used as several of the items deleted in the latest version of the SBQ-J appeared potentially useful to the present study. Of the 102 items, 24 were discarded as inappropriate for the present study, and the wording of 18 of the remaining 78 items was slightly amended to provide more appropriate terminology.

Table 2

Study Behaviour Questionnaire
Scales (SBQ-J)

Scale	Description[1]
1. Academic Aspiration	Pragmatic, grade oriented. University viewed as means to an end.
2. Academic Interest	Intrinsically motivated. Study viewed as an end in itself.
3. Academic Neuroticism	Confused. Overwhelmed by the demands of course work.
4. Internal Locus of Control	Sees "truth" as coming from within and not from external authority.
5. Study Skills and Organization	Works consistently, reviews regularly, and schedules work.
6. Fact-Rote Strategy	Centres on facts and details. Rote learns.
7. Dependence	Rarely questions instructors or texts. Needs support.
8. Meaning Assimilation	Reads widely. Relates to that which is known. Meaning oriented.
9. Test Anxiety	Very concerned about tests and exams. Fearful of failure.
10. Openness	University considered a place where values are questioned.

[1] Note: Descriptions relate to individuals scoring high on that particular scale.

Reliability and Validity of the Study Behaviour Questionnaire

The reliability and validity of the SBQ-J items has been investigated in a series of studies (Biggs, 1970(a); 1970(b); 1973(a); 1973(b)). The findings of these studies indicate an adequate degree of face and construct validity, and the items comprising each scale appear to be reliably measuring aspects of the same study behaviour dimensions.

Of the 78 items comprising the SBQ-JS, 66 have been established as highly reliable items, contributing significantly to the SBQ-J scales (Biggs, 1973(b)). The remaining 12 items, although of lower validity in contributing to the SBQ-J scales, were included in the SBQ-JS as potentially useful for the open university sample.

Subjects were required to use a standard IBM answer sheet in responding to this questionnaire.

The Paragraph Completion Test (PCT)

The PCT was employed as a measure of conceptual level. The test consists of several sentence stems which serve to elicit projective responses (see Appendix B). These stems present the subject with items concerning structure, conflict, and uncertainty, and assess the subject's level of integrative complexity in handling general interpersonal and uncertainty stimuli. Six stems were utilized and subjects were advised to respond for no longer than two to three minutes per stem.

For scoring purposes, the stem "Parents . . . " was omitted as it appears to be of lower reliability than the other five for older

subjects (Schroder et al., 1967). The PCT stems are scored by judges trained in the use of a structural scoring manual (Phares and Schroder, 1969), and the scoring procedures focus exclusively upon the structural aspects of a subject's response.

> Responses which could be generated by a single rule (perspective) are given a score of 1, those clearly indicating alternate but unconnected perspectives a score of 3, those indicating a relationship between two perspectives a score of 5, and those indicating multiple relationships a score of 7. Points 2, 4, and 6 represent intermediate judgment between these basic information processing structures (Schroder, 1971:258).

Validity of the PCT

The PCT was specifically designed to measure organizational processes; that is, integrative aspects of conceptual functioning. Direct supportive evidence for the construct validity of this test is provided by Faletti (1968) who found that PCT scores remained substantially unchanged when experimentally induced differentiation was increased. Also, PCT scores sytematically increased when organizational complexity was experimentally increased, with induced differentiation held constant. Several other studies have also been reported as providing support for the constant validity of this test (Gardiner and Schroder, 1972; Schroder, 1971; Schroder et al., 1967). In addition, it should be noted that factor analytic studies involving the PCT and measures of differentiation have typically found PCT scores to be factorially independent of scores on differentiation measures (Gardiner, 1968; Stewin, 1969; Vannoy, 1965).

The PCT has also been demonstrated to yield low but significant correlations with other measures of organizational properties such as; the "This-I-Believe" Test (Harvey, 1964), and the Interpersonal Topical

Inventory (Tuckman, 1966). As mentioned earlier (Chapter 2, Part 1) the PCT has been found to be positively correlated with related personality constructs such as moral maturity and internal control, and negatively correlated with such constructs as authoritarianism and dogmatism. In addition, PCT scores appear largely unrelated to scores obtained on tests of general ability and verbal fluency (Hunt, 1971; Schroder, 1971).

Reliability of the PCT

Scoring instructions appear sufficiently precise that high inter-rater reliabilities can be obtained within three to four days of rater training, with reliabilities ranging from 0.80 to 0.95 being reported (Schroder et al., 1967). The five PCT stems utilized for the present study typically provide inter-correlations ranging from 0.60 to 0.75 (Schroder et al., 1967; Stewin, 1969).

Test-re-test reliability coefficients of from 0.52 to 0.67 have been reported (Gardiner and Schroder, 1972). The lowest values were obtained using high school subjects over a period of 12 months and the highest values have been obtained using college students over a three month period. These results are in accord with theoretical expectations that complexity continues to develop through high school and college.

In order to ensure maximum scoring reliability, PCT protocols were scored by a scoring service provided by J. Phares, co-author of the PCT scoring manual (Phares and Schroder, 1969). Each subject was assigned a score equal to the sum of the two highest complexity scores obtained on the five scored stems. Subjects receiving a score of four

or less are categorized as concrete, those receiving a score of five or six as intermediate complexity, and those scoring seven or above as high complexity individuals.

Reading Comprehension Test

A test of reading comprehension was used in this study as an indicator of general reading ability (see Appendix C). A measure of reading ability was considered necessary for this investigation in view of the wide range in formal academic qualifications evidenced by the chosen study population. That is, reading ability is considered to be a possible confounding variable with respect to the study behaviours of students involved in what is essentially a correspondence course.

The test adopted for use was the comprehension subtest of the Survey Section of the Diagnostic Reading Tests; upper level, form A (The Committee on Diagnostic Reading Tests, 1966). This test was adopted for several reasons. First, the test is designed to measure study-type reading skills and includes content appropriate to the course utilized for this study. Also, the test is designed for administration to students in grade seven through first year university; a range that appears appropriate for this study sample, which exhibits a wide range of formal academic achievement. In addition, although this subtest is normally administered within prescribed time limits, it is primarily designed as a power test. Such a test appears suitable for the unsupervised testing format of this study.

This comprehension subtest was initially designed as part of a screening test intended for the assessment of a student's general level of reading competence. Since initial publication in 1947 the test

has been widely used in both high school and college reading programmes and has been described as one of the better instruments for the evaluation of overall reading ability (Turnbull, 1968).

Validity and Reliability of the Comprehension Test

The test emphasizes inference rather than factual recall and "the skills tested by the comprehension materials are broad and of central importance in reading" (Turnbull, 1968:164). The test appears to measure study-type reading skills and thus appears to possess adequate face validity.

The administration manual provides little evidence regarding validity, but coefficients in the high 0.40's are supplied. However, normative data is poorly presented and appears a little inadequate, despite occasional revisions. A median correlation of 0.62 has been obtained between scores on this test and vocabulary scores. Thus there is some measure of independence between this test and simple tests of vocabulary. In general terms, this comprehension test appears to be a measure possessing construct validity on a par with other tests of its kind.

Test-re-test reliabilities of the order of 0.80 have typically been obtained. The normative data suggests that this test reliability differentiates between subjects scoring at the extremes of its range but that its reliability at intermediate levels is somewhat suspect. Nevertheless, this test appears to possess equivalent validity and reliability to similar tests of reading comprehension.

Although subjects were requested to note the time taken to complete this test, time taken was not considered in scoring. The

maximum score possible was 20.

Instructional Preferences Questionnaire

This questionnaire was designed specifically for use in the present study (see Appendix D). It was intended as a measure of several aspects of student study behaviours and preferences as follows: First, it attempted to assess a student's perceived need for external structure and motivation at a macro-environmental level. Second, it attempted to assess a student's need for structure at a micro-environmental level as evidenced by his reactions to, and use of, the supplied instructional units. Lastly, the questionnaire attempted to assess a student's preferred sensory modality for learning; visual or aural.

Reliability and Validity of the IPQ

No evidence for the construct validity of the IPQ can be offered. However, informal dialogue with survey respondents indicates that this questionnaire does at least possess adequate face validity.

Reliability was assessed by means of test-re-test correlations. An interval of approximately two months occurred between the two administrations of the IPQ (see Table 3). The correlations obtained should be interpreted with caution in view of the small sample size and small range of possible scores. A fairer indication of the IPQ's stability is probably provided by considering percentage agreements; which indicate a reasonable degree of item stability.

Table 3

Instructional Preferences Questionnaire: Reliability

Item No.	Test-Retest Reliability* (Stability)	Percentage Agreement** 1	2
1	0.63	43	71
2	0.53	29	93
3	0.72	36	93
4	0.75	79	86
5	0.67	64	86
6	0.88	93	93
7	0.97	93	100
8	0.67	43	79
9	0.37	71	93
10	0.68	36	93
11	0.53	21	100
12	0.55	64	79
13	0.61	71	79
14	0.72	57	79

* n = 14

**Note: Column 1 refers to occurrence of complete test-retest agreement.
Column 2 refers to test-retest agreement within 1 scale gradation.

STATISTICAL ANALYSIS

Part 1. Study Validity

In educational research there are two fundamental "types" of experimental validity of concern to the researcher; internal and external. Internal validity relates to the extent to which the results may be considered to derive from experimental manipulation; that is, the interpretability of findings. In contrast, external validity relates to the extent to which the experimental findings can be generalized to other populations and settings.

To date, internal validity has received the weight of concern in educational research. Thus the emphasis has been upon the degree to which a research design approximates a truly experimental one. Probably the most influential single treatment of experimental validity is that of Campbell and Stanley (1963) which discusses the limitations inherent in several types of experimental design commonly employed in educational research. Although these authors treated both internal and external validity, they echoed the then prevalent emphasis upon considerations of internal validity.

It is often extremely difficult, if not impossible, to effect a true experimental design in educational research. In addition, an overconcern with a "clean" experimental design can lead to research findings which lack external validity and cannot be readily applied to real educational situations. The above emphasis on internal validity has generally resulted in fragmentary and over-simplified experimental findings that have proven of little real use to the professional educator (Hilgard and Bower, 1966).

More recently, increased attention has been paid to the representativeness of educational research; that is, external validity (Bracht and Glass, 1968). This view emphasizes the need for researchers to operate in real, multivariate, educational environments as opposed to artificial experimental environments in which the human subject is regarded as a relatively passive being, subjected to a radically simplified environment. Bracht and Glass (1968) outlined two main classes of external validity; population validity, and ecological validity. The former includes considerations of generalizing from samples to the larger population, and aptitude-treatment effects. The latter includes considerations of describing independent variables, the measurement of dependent variables, Hawthorne and Rosenthal effects, the effects of the subject's past history, and pretest and posttest effects.

Snow (1974), under the heading of population validity, outlines three steps in making inferences from empirical data. First, generalization from the sample to the population from which it was drawn. Second, generalization from this population to the larger population of ultimate concern to the researcher. Finally, relating the generalization to variables of particular concern. The first two steps are statistical and

> . . . a truly representative design, . . . would be one in which random sampling of Ss obtained throughout. Failing this, and all empirical educational studies fail this, the only recourse is to detailed description of the target population, the accessible population, and sample at hand, followed by the testing of interactions in the latter (Snow, 1974:271).

The design is then only quasi-representative but the experimenter has at least checked for the more obvious threats to the validity of his

generalizations. Thus a thorough description of sample characteristics is crucial to effective generalization.

Whereas population validity is concerned with the representativeness of the chosen sample, ecological validity concerns the representativeness of the experimental treatment. Ecological validity can therefore be treated in a parallel fashion to population validity. Again a thorough description of the treatment is critical to the generalizability of study findings.

The inclusion of substantial descriptive data tends to provide for a rather untidy statistical analysis. Thus more powerful factor analytic and analysis of variance designs are often unsuitable and simpler, less powerful, correlational analysis technqiues may be more appropriate where external validity is of concern.

The above serves as a preamble and partial defence for the statistical methodology utilized in this study and outlined below.

The adopted statistical design is essentially a correlational one. Although it may be termed a "quasi-experimental" design it is probably more appropriately termed a "data-analysis" design (Campbell and Stanley, 1963). This methodology has been adopted as this study is essentially an exploratory one, serving as a preliminary survey of hypotheses to provide a basis for forming further, more definitive, hypotheses; which may in turn be checked in a more systematic manner. The emphasis of the present study is upon considerations of external rather than internal validity. To this end, an attempt has been made to obtain pertinent descriptive sample data in order that the sample utilized may be sufficiently characterized to facilitate generalization to a larger population of open university students. In addition, an

attempt has been made to dimensionalize some aspects of the treatment conditions to further facilitate attempts to generalize the study findings.

Part 2. Statistical Procedures

The statistical procedures employed were as follows. First, subsidiary hypothesis H_2 was tested by comparing the frequencies of low and high CL score with those expected on the basis of no difference; that is, an even "split." Frequencies were compared using a chi square sampling distribution. Next, descriptive sample variables were considered, one at a time, in order to characterize respondents and compare them to non-respondents. This was effected using a two-dimensional cross-tabulation employing a chi square test of independence. Student positions on each variable were categorized in order to facilitate the use of the above method. For example, a student's age was placed in one of five categories; 24 years of age and under, 25 years to 34 years, 35 years to 44 years, 45 years to 54 years, and 55 years of age and over. The analysis was effected through the use of a programme developed by the Division of Educational Research Services (DERS) at the University of Alberta. The programme, NONPO2, provides for appropriate corrections for small cell frequencies.

The main hypothesis H_1 was tested by calculating Pearson product-moment correlations between student PCT scores and each item on the SBQ-JS questionnaire. In addition, student scores on the reading comprehension test were included and the effects of this variable were eliminated or "partialed out" to provide partial correlations between the first two sets of measures. The analysis

was effected through use of the DERS MULRO7 programme.

Finally, subsidiary hypothesis H_3 was tested using the same procedure as for hypothesis H_1, with the IPQ items substituted for the SBQ-JS questionnaire items.

All tests of significance utilized for testing hypotheses H_1 and H_3 employed a two-tailed t sampling distribution, with probabilities of less than, or equal to, 0.10 accepted as significant. This level of significance was adopted for the following reasons. The final responding sample size obtained was small (max. n=47) thus requiring higher correlations or frequencies for significance. In addition, a major concern of this study is to identify possible relationships worthy of further experimental study. The concern is therefore with minimizing type II errors; that is, accepting the null hypothesis when in fact it is false.

For comparisons of responding subjects versus non-responding subjects a probability level of 0.05 was adopted for testing significance. This lower value was adopted in view of the larger number of subjects involved in these comparisons (n=97).

CHAPTER 5

RESULTS AND DISCUSSION

PART 1: SAMPLE CHARACTERISTICS

As stated in Chapter 4, a prime concern of this study is with the problems of external validity; that is, the representativeness of the sample from which data has been obtained. The first, and major, step is to compare sample responders with non-responders. Comparisons were therefore made with respect to the following variables; sex, marital status, age, area of domicile, level of previously obtained formal education, course credit status, continuation in or withdrawal from the course, and academic progress during the experimental period. The composition of the total population, responding group, and non-responding group with respect to each of the above variables is shown in Tables 4 to 11 inclusive. Of the eight statistical comparisons made between responders and non-responders, two achieved significance; credit status ($p=0.003$), and academic progress ($p=0.000$). One other comparison, concerning marital status, approached significance ($p=0.086$).

Inspection of Table 9 shows that not one non-credit student responded to the study forms. The study findings must therefore be limited to those students studying for university credit.

Inspection of Table 11 reveals marked differences between responders and non-responders with respect to course progress. A total of 83 percent of all responders progressed beyond the first unit

Table 4

Population Characteristics: Sex

Group	Sex		Totals
	Male	Female	
Responders	22	30	52
Non-responders	23	22	45
Total sample	45	52	97

Chi square = 0.75
Degrees of freedom = 1
p = 0.39

Table 5

Population Characteristics: Marital Status

(a) Group	Married	Single	Divorced/ Separated	Widowed	Totals
Responders	41	4	4	1	50
Non-responders	30	9	5	1	45
Total sample	71	13	9	2	95

Chi square = 3.49
Degrees of freedom = 3
p = 0.32

(b) Group	Married	Single	Totals
Responders	41	9	50
Non-responders	30	15	45
Total sample	71	24	95

Chi square = 2.95
Degrees of freedom = 1
p = 0.09

Table 6

Population Characteristics: Age

Group	Age Group (Years)					Totals
	24 or less	25-34	35-44	45-54	55 or more	
Responders	5	22	14	5	4	50
Non-responders	7	16	14	4	3	44
Total sample	12	38	28	9	7	94

Chi square = 1.16
Degrees of freedom = 4
p = 0.89

Table 7

Population Characteristics: Rural vs. Urban

Group	Location		Totals
	Urban	Rural	
Responders	29	23	52
Non-responders	26	19	45
Total sample	55	42	97

Chi square = 0.04
Degrees of freedom = 1
p = 0.84

Table 8

Population Characteristics: Previous Level of Formal Education

Group	Level of Education				Totals
	Less than Grade 12	Approx. Grade 12	Between Grade 12 and Degree	Degree or Higher	
Responders	12	19	18	3	52
Non-responders	15	21	7	1	44
Total sample	27	40	25	4	96

Chi square = 5.65
Degrees of freedom = 3
p = 0.13

Table 9

Population Characteristics: Credit Status

Group	Credit Status		Totals
	Credit	Non-credit	
Responders	52	0	52
Non-responders	38	7	45
Total sample	90	7	97

Chi square = 8.72
Degrees of freedom = 1
p = 0.003

Table 10

Population Characteristics: Withdrawals

Group	Status		Totals
	Non-withdrawals	Withdrawals	
Responders	49	3	52
Non-responders	40	5	45
Total sample	89	8	97

Chi square = 0.91
Degrees of freedom = 1
p = 0.34

Table 11

Population Characteristics: Academic Progress

(a)

Group	Academic Progress					Totals
	No units Complete	Unit 1 Compl.	Unit 2 Compl.	Unit 3 Compl.	More than 4 units Compl.	
Responders	9	1	12	8	22	52
Non-responders	26	5	12	2	0	45
Total sample	35	6	24	10	22	97

Chi square = 36.21
Degrees of freedom = 4
p = 0.000

(b)

Group	Academic Progress*		Totals
	No Progress	Progress	
Responders	9	43	52
Non-responders	26	19	45
Total sample	35	62	97

Chi square = 17.13
Degrees of freedom = 1
p = 0.000

* Progress defined as a minimum of one unit completed.

of the course, whereas 58 percent of the non-responders did not. Viewed another way, over two-thirds of all students progressing beyond the first course unit responded to the questionnaire. The above figures become 81 percent, 69 percent and 75 percent when completion of the second unit becomes the criterion for progress. As the criterion for real academic progress increases in severity, so the proportion of responders in this category increases, to a final value of 100 percent when completion of four or more course units is employed as the criterion.

A re-examination of non-credit students with respect to academic progress provides further clarification as to the characteristics of the responding group of students. None of these had completed more than two course units by the end of the experimental period and five of them failed to complete the first course unit. These results serve to underline the "active student" characteristics of the responding group.

The comparisons with respect to marital status (Table 5) indicate a tendency for more married students than single students to respond. Further inspection of the data indicates that this tendency derives from a proportionately greater number of married women responding. However, this tendency is not significant in relation to the total number of married women, who comprised almost half of the student population studied.

Of the eight descriptor variables considered, academic progress is probably the most important. It effectively distinguishes between students actively pursuing their studies from those who are no more than a name on the course register. This study is solely concerned

with the study habits of "real" students; that is, students actively engaged in academic study. In view of the marked differences obtained between responders and non-responders with respect to academic progress, it appears that responders differ as a group from non-responders. It is therefore doubtful that the former can be considered as representative of the total population chosen for this study. However, the responding group does bear a marked similarity to that group of students actively pursuing their academic studies. That is, the responding group closely approximates the "real" student population of the course under study (Hartnett et al., 1974).

With the above in mind, the results discussed in the second section of this chapter will be interpreted as representative of the active or "real" student enrollment of the total nominal population studied.

PART 2: TESTING OF HYPOTHESES

Subsidiary Hypothesis H_2

The distribution of student conceptual level includes a majority of low or "concrete" conceptual level students (see Table 12(a)). However, this majority is found to be statistically non-significant when obtained and expected frequencies are compared (see Table 12(b)). Thus the hypothesis that "there is no difference in the frequencies of high and low CL students obtained in the chosen open university population" cannot be rejected.

The distribution of student CL obtained is skewed toward the low end of the CL dimension and closely resembles distributions previously obtained from conventional university undergraduate

Table 12

Distribution of PCT Scores

(a) CL Category	PCT Score	Frequencies: Number	Frequencies: Category Total
Low CL	2	3	29
	3	8	
	4	18	
Intermediate CL	5	9	15
	6	6	
High CL	7	4	4
Totals		48	48

(b) CL Category	Observed Frequency	Expected Frequency
Low (PCT score $\leq$ 4)	29	24
High (PCT score $\geq$ 5)	19	24

chi square = 2.1

$0.10 < p < 0.20$

populations (Tuckman and Orefice, 1973). In fact, the obtained distribution is typical of that normally obtained from the undergraduate population of an average, or middle-level, North American university (Phares, 1975[1]).

With the findings of the preceding chapter section in mind it would therefore appear to be a reasonable assumption that those social science students who are actively pursuing their studies at Athabasca University are similar, in terms of conceptual level, to their counterparts attending a conventional North American university.

Main Hypothesis H_1

> There is no significant relationship between student CL, as measured by the PCT, and student responses to any item on a study behaviour questionnaire.

Initially, a total of 19 SBQ-JS items were found to correlate significantly with student CL. With reading ability effects controlled for, an additional item reached statistical significance. raising the total number of significant correlations to 20 (see Tables 13 to 22). Thus 26 percent of the questionnaire items correlated significantly with student PCT scores, a figure substantially greater than that which would be expected on the basis of chance. The null hypothesis is therefore rejected.

In order that the PCT:SBQ-JS correlations may be discussed in a clearer more meanginful context, they will be divided into ten categories equivalent to Biggs' ten study behaviour scales.

Scale 1--Academic Aspiration. A correlation of -.12 was obtained between student scores on this scale and conceptual level (see Table 13).

Table 13

Study Behaviour Versus CLI Subscale Correlations

Scale No.	Scale Title	Correlation
1	Academic Aspiration	-.12
2	Academic Interest	.44***
3	Academic Neuroticism	-.40***
4	Internal Locus of Control	.14
5	Study Skills and Organization	.04
6	Fact-Rote Strategy	-.25*
7	Dependence	-.20
8	Meaning Assimilation	.05
9	Test Anxiety	-.30**
10	Openness	.28*

* $p \leq 0.10$
** $p \leq 0.05$
*** $p \leq 0.01$

Of the five items comprising this scale, four correlated negatively with conceptual level (see Table 14). All five correlations were low and non-significant (-.18 to +.14). Nevertheless, the correlations, except one, were positive and exhibit a trend in the direction to be expected from Biggs' description of this scale (Table 2). Individuals scoring high on these items would be expected to be motivated toward study by external, non-academic factors. That is, study is viewed as a means to an end. Such externally motivated behaviour is considered more characteristic of low complexity individuals (Schroder et al., 1967), indicating a negative correlation between CL and scores on this scale. However, such expectations should be qualified; as the extent to which these items indicate externally directed behaviour as opposed to autonomous behaviour directed toward other, non-academic, goals is questionable. The above correlations thus indicate very tentative, and insignificant, support for Biggs' scale description in terms of conceptual level characteristics.

Scale 2--Academic Interest. A correlation of .44 was obtained between student scores on this scale and conceptual level.

All nine items comprising this scale correlated positively with CL (.05 to .36, see Table 15). Six correlations were significant, thus providing the greatest proportion of significant correlations obtained on any one scale. Individuals scoring high on items comprising this scale are characterized as intrinsically motivated toward academic study (see Table 2). Such information-seeking behaviour closely resembles that ascribed to high CL individuals (Harvey et al., 1961) and therefore the above items would be expected to correlate

Table 14

Study Behaviour Versus CL: Scale 1--Academic Aspiration

Item No.	Study Behaviour Questionnaire Item	Correlations "Normal"	Correlations Partial
18	As long as I do well on the examinations, I don't worry much about the particular content of a course.	-.18	-.18
62	I try to select my courses on the basis of their practical value for my career plans rather than for their academic interest.	-.17	-.18
10	I question the value of undergraduate courses which take a theoretical, academic instead of a practical approach.	.09	.14
78	I feel that one of the most important considerations in choosing a course is whether or not I will be able to get top marks in it.	-.08	-.07
1	In choosing between two courses, I put more emphasis on how practical rather than on how interesting a course may be.	-.05	-.02

Table 15

Study Behaviour Versus CL: Scale 2--Academic Interest

Item No.	Study Behaviour Questionnaire Item	Correlations "Normal"	Correlations Partial
2	I usually become increasingly absorbed in my work the more I do.	.33**	.36**
34	I would rather take a difficult, interesting course instead of an easy, uninteresting course.	.30**	.33**
11	I have a strong desire to excel in all my studies.	.27*	.28*
63	I spend a lot of my free time finding out about interesting topics which have been discussed in different classes.	.25*	.27*
71	I find that studying academic topics can at times be as exciting and gripping as reading a good novel.	.27*	.27*
19	I find most new topics interesting and often spend extra time trying to obtain more information about them.	.18	.26*
43	I find university more relevant than high school because I am able to study areas which really interest me.	.12	.12
51	I find that I have to do enough work on a topic so that I can form my own point-of-view before I am satisfied.	.10	.10
56	I feel that virtually any topic can be highly interesting once I get into it.	.05	.06

* $p < 0.10$

** $p < 0.05$

positively with CL. The correlations obtained for items comprising the Academic Interest scale may therefore be viewed as providing strong support for Biggs' scale in terms of conceptual level characteristics.

Scale 3--Academic Neuroticism. A correlation of -.40 was obtained between student scores on this scale and conceptual level.

All six items comprising this scale correlated negatively with conceptual level (-.11 to -.45). Of these six correlations, three were significant (see Table 16). An individual scoring high on this scale is characterized as easily overwhelmed and confused by the demands of course work. Such a student favours clearly structured subject matter and exhibits an inability to engage in complex decision-making behaviour. Such "dependent" behaviours are clearly associated with low CL individuals (Hunt, 1971) and therefore the items comprising the Academic Neuroticism scale would be expected to correlate negatively with CL. The correlations obtained support this view and provide support for Biggs' description of this scale in terms of CL characteristics.

Scale 4--Internal Locus of Control. A correlation of .14 was obtained between student scores on this scale and conceptual level.

Of the ten items comprising this scale, eight correlated postively with CL (see Table 17). All ten correlations were low and non-significant. Nevertheless, the eight positive correlations exhibit a trend in the direction to be expected from Biggs' description of this scale. The scale description appears similar to Rotter's concept of internal control. However, Biggs has attempted to relate these items

Table 16

Study Behaviour Versus CL: Scale 3--Academic Neuroticism

Item No.	Study Behaviour Questionnaire Item	Correlations "Normal"	Correlations Partial
35	It is inevitable that at first one's understanding of a subject will be confused, but I find this initial confusion very distressing.	-.44***	-.45***
26	When writing an essay, I find that the topic rapidly becomes more and more complex and I have great difficulty in tying up all the loose ends at the finish.	-.29**	-.34**
52	I prefer instruction that follows the course outline, rather than that which goes off the topic.	-.28*	-.26*
20	I rarely keep up to date with suggested readings that are meant to keep pace with the units.	-.21	-.23
3	I find a new and unfamiliar approach to an already learned topic confusing and depressing.	-.20	-.20
64	I think that it is unreasonable for an instructor to expect completely original work from an undergraduate student.	-.12	-.11

* $p < .10$

** $p < .05$

*** $p < .01$

Table 17

Study Behaviour Versus CL: Scale 4--Internal Local of Control

Item No.	Study Behaviour Questionnaire Item	Correlations "Normal"	Correlations Partial
53	I find I personally have to see a cooperative venture (say a group project) through to the end rather than delegate responsibility to a colleague.	-.20	-.19
27	I believe strongly that my main aim in life is to discover my own philosophy and belief system and to act strictly in accordance with it.	.18	.17
57	I feel that I might have some power, eventually, to change things in the world that I see now to be wrong.	.18	.17
44	When people appear to blame me for something I seriously consider the possibility that they might be right.	.16	.15
21	While I realize that truth is forever changing as knowledge is increasing, I feel compelled to discover what appears to me to be the truth at this time.	.12	.14
36	What I make of my own life is my own responsibility. I cannot reasonably blame my background, the system, or just sheer bad luck for whatever happens to me.	-.07	-.12
4	When I have worked something out for myself and I really believe my view to be sound, I will stick to it if other students or even the instructor clearly disagree with me.	.08	.10
12	I have to be sure of something in my own mind before I will accept it as being valid or true.	.10	.09
72	"Inner certainty" is more important to me than modifying my views to fit more easily with what other responsible people think.	.06	.05
65	When I have come to an important conclusion, I feel an overpowering urge to convince other people that it is right.	.04	.01

to Rokeach's dogmatism construct (Biggs, 1970(b)). An examination of the items reveals that most of them appear more related to Rotter's concept, although two (items 53 and 65) appear to tap aspects of dogmatism. In view of the low correlations typically obtained between measures of the above two constructs and the PCT it is not surprising that the correlations obtained between the above items and CL are low.

Scale 5--Study Skills and Organization. A correlation of -.04 was obtained between student scores on this scale and conceptual level.

Of the ten items comprising this scale, one correlated significantly with CL (see Table 18). This and three other correlations were negative. There appears to be a "mix" of personality characteristics tapped by this scale; and an examination of these items and their correlations with CL indicates that, although some items could be viewed as a measure of well-organized study behaviour, others appear more indicative, for high scorers, of over-compensatory study strategies. This echoes previous findings that "good" study havits are not necessarily the prerogative of "good" students (Maddox, 1963). It therefore appears that the evaluation of the "goodness," or otherwise, of study behaviours greatly depends upon the biases of the researcher. With reference to CL attributes, this scale appears to tap both autonomous and over-compensatory, "dependent" behaviours; that is, both complex and concrete behaviours.

Scale 6--Fact-Rote Strategy. A correlation of -.25 was obtained between student scores on this scale and conceptual level.

With one exception, the nine items comprising this scale evidenced moderate, negative correlations with CL, of which three were

Table 18

Study Behaviour Versus CL: Scale 5--Study Skills and Organization

Item No.	Study Behaviour Questionnaire Item	Correlations "Normal"	Correlations Partial
54	I try to anticipate exam topics and questions and use these as study guides.	-.27*	-.27*
37	I try to keep up with all of the suggested readings that go with the units.	.19	.21
58	When a test has been marked, I go over it carefully correcting all errors and trying to understand why I made original mistakes.	-.14	-.17
66	I keep reviewing important topics until I understand them completely.	-.19	-.15
22	After a study session, I reread my notes to make sure they are legible and that I understand them.	-.16	-.15
28	I keep neat, carefully arranged notes.	.09	.15
73	I find that the most worthwhile summaries of material are those which I prepare myself rather than those that I take out of textbooks.	.12	.14
5	I try to do all my assignments as soon as they are assigned.	.07	.11
13	I try to work consistently throughout the course and review regularly when the exams are close.	.03	.06
45	I summarize suggested readings and include these as part of my notes on a topic.	.03	.05

* $p < 0.10$

significant (see Table 19). An individual scoring high on this scale is characterized as a rote learner who centres upon facts and details. Such an individual is thus highly dependent upon external judgments owing to his concern with minimal conceptual "conflict," and exhibits similar behaviours to a low CL individual. The correlations obtained for this scale thus provide substantive support for this scale in terms of conceptual level characteristics.

Scale 7--Dependence. A correlation of -.20 was obtained between student scores on this scale and conceptual level.

All six items comprising this scale correlated negatively with CL; one of them significantly (see Table 20). An individual scoring high on these items is described as relying heavily upon the judgment of authoritative others. Such an individual is even less tolerant of conflicting or ambiguous information than the "fact-rote" learner and appears very similar to a low or concrete CL individual. The above results therefore indicate tentative support for this scale in terms of conceptual level characteristics.

Scale 8--Meaning Assimilation. A correlation of .05 was obtained between student scores on this scale and conceptual level.

Of the eight items comprising this scale, five correlated positively with CL (see Table 21). All of the correlations were low and non-significant (-.14 to +.17). An individual scoring high on these items is described as interested in obtaining different points of view and attempting to integrate them independently (see Table 2). Such a description appears extremely similar to that used by Schroder (1971) to describe a high complexity individual. It is therefore

Table 19

Study Behaviour Versus CL: Scale 6--Fact-Rote Strategy

Item No.	Study Behaviour Questionnaire Item	Correlations "Normal"	Correlations Partial
55	I prefer to write term papers or essays which answer specific questions rather than cover general topics.	-.31**	-.36**
23	I prefer subjects with a lot of factual content to more theoretical kinds of subjects.	-.31**	-.32**
6	I think most people can actually learn better when they are given the facts about a topic instead of having to figure them out by themselves.	-.27*	-.25*
67	I prefer a text which lays things out carefully in point form and contains frequent tables and summaries, to one which is written almost entirely in paragraph form.	-.20	-.20
38	I make a point of studying set readings in detail rather than attempting to cover both required and optional readings.	-.22	-.20
29	I prefer to learn the facts and details about a topic rather than a theoretical understanding of it.	-.21	-.19
14	I learn some things by rote, going over and over them until I know them by heart.	-.20	-.18
46	I don't spend time on learning things that I know won't be asked in the exams.	-.12	-.14
74	I find that most seminar discussions are a waste of time because they usually refer to opinions rather than to hard facts.	.08	.08

* $p < 0.10$

** $p < 0.05$

Table 20

Study Behaviour Versus CL: Scale 7--Dependence

Item No.	Study Behaviour Questionnaire Item	Correlations "Normal"	Correlations Partial
59	I prefer to accept what my instructor says even though it sometimes means that I have to change my own ideas.	-.31*	-.31*
30	I am aware that lecturers and textbook writers know a lot more than I do and so I rely on their judgment rather than on my own.	-.18	-.17
39	I take seriously anything that I have been taught in my lessons, or that is in my readings so that I would change my interpretations only on the strongest evidence.	-.16	-.14
47	I would question the statements and ideas of my instructors only under special circumstances.	-.11	-.10
75	I feel that it is unfair to include material in tests which has not been covered in the required text.	-.04	-.04
68	I prefer texts which present a unified point of view and are written by an authority instead of a collection of articles by various authors on a topic.	-.01	-.01

* $p < 0.05$

Table 21

Study Behaviour Versus CL: Scale 8--Meaning Assimilation

Item No.	Study Behaviour Questionnaire Item	Correlations "Normal"	Correlations Partial
48	While I am studying, I often think of real life situations in which the material that I am learning would be handy, and useful to know.	.14	.17
15	I try to relate what I have learned in one subject to that in another.	-.14	-.14
40	When I approach a new piece of reading material, I try to note both the basic factual knowledge it contains and the general theoretical points; I rote learn the former, and think about and chew over the latter until both parts complement each other, and the whole hangs together. (Rate yourself according to whether this is a deliberate and conscious strategy.)	.11	.13
60	I find that discussing a new topic with someone who is familiar with it often helps me understand it better.	.07	.11
7	I try to relate new material, as I am reading it, to previously learned material.	.10	.10
76	When I find that an assigned reading is too difficult, I try to find a less rigorous treatment and then return to the original one later.	-.10	-.08
31	When I am reading fresh material, I try to think of what I already know that is related to it and frame questions on the basis that the new material may answer.	-.04	-.06
24	In reading new material I often find that I'm continually reminded of material I already know and see the latter in a new light.	.05	.03

surprising that items on this scale did not correlate positively and significantly with CL. A possible explanation is that the questions were inappropriate for the context of this study. For example, most students are enrolled only in the introductory social science course. Thus most of the items, which relate to previous and concurrent courses, are probably inappropriate. It is noteworthy that the two highest positive correlations obtained derive from items relating to the integration of "real life" and academic knowledge, and the integration of the information contained in the supplied course materials.

Scale 9--Test Anxiety. A correlation of -.30 was obtained between student scores on this scale and conceptual level.

Of the seven items comprising this scale two provided very low positive correlations. Four of the five negative item correlations were significant (see Table 22). An individual scoring high on these items is described as very concerned about formal tests and examinations and fearful of failure on such assessments. There is therefore a strong concern with external evaluation of worth. It is noteworthy that only those items relating directly to test achievement correlated significantly with CL. Thus, insofar as this scale assesses concern with external evaluation; that is, dependent, concretistic behaviour, it is substantially correlated with conceptual level.

Scale 10--Openness. A correlation of .28 was obtained between student scores on this scale and conceptual level.

All but two of the eight items comprising this scale correlated positively with CL (see Table 23). Two of these positive correlations attained significance. An individual scoring high on these scale

Table 22

Study Behaviour Versus CL: Scale 9--Test Anxiety

Item No.	Study Behaviour Questionnaire Item	Correlations "Normal"	Correlations Partial
16	I am discouraged by a poor mark on a test and worry about how I will do on the next test.	-.36**	-.36**
32	I am concerned about how poor results on a test will affect my overall grade in a course.	-.35**	-.35**
69	Even when I have studied hard for a test, I worry that I may not be able to do well on it.	-.33**	-.34**
8	I worry a lot about how I am going to do when I am studying for a test.	-.25*	-.25*
61	I worry that an instructor will try and trick me on a test even though I know the material well.	-.11	-.12
41	I feel that formal examinations are a poor method of measuring my knowledge in a course.	.06	.09
49	I feel that most tests examine material beyond that which I should reasonably be expected to know.	.05	.07

* $p < 0.10$

** $p < 0.05$

Table 23

Study Behaviour Versus CL: Scale 10--Openness

Item No.	Study Behaviour Questionnaire Item	Correlations "Normal"	Correlations Partial
17	I expect that my university studies will change my views about such things as politics, my religion, and my philosophy of life.	.30**	.28*
42	I think that the university should encourage experimentation and change in our society.	.26*	.28*
77	I believe that an instructor has the right to critically discuss controversial questions although this may offend some.	-.17	-.21
25	I think that one important benefit of my university studies will be to give me a more general viewpoint.	.17	.16
70	I believe that an instructor has the right to expound any viewpoint he wishes so long as he is sincere in doing so.	.12	.12
9	I am quite prepared to find that my university studies will raise more questions than they settle.	.07	.06
33	I find that I am very interested in trying to understand the point-of-view of other students, especially those from different backgrounds than myself.	.05	.05
50	I believe that in university courses a student should be exposed to all kinds of political and social viewpoints.	-.01	-.02

* $p < 0.10$

** $p < 0.05$

items is described as viewing the university as a place where controversy is encountered. Such an individual would be expected to be of high complexity, as he is prepared to engage in flexible judgmental behaviour and is prepared to accommodate to more differentiated informational dimensions. The phenomenon of similarly worded items correlating in opposite directions with CL is difficult to explain in view of the above argument. A possible explanation is that many subjects may have reacted more strongly to the peripheral implications of several items than to their main emphasis. For example, items 70 and 77 are very similarly worded except that the latter mentions the possibility of offending students. In view of the above, the obtained correlations provide qualified support for this scale in terms of conceptual level characteristics.

The above discussions can be summarized as follows. The Academic Interest, Academic Neuroticism and Fact-Rote Strategy scales provided fairly consistent and substantive item correlations with conceptual level, in the expected directions. The Test Anxiety and Openness scales also provided substantive item correlations in the expected direction but appeared contaminated with inconsistent items with respect to conceptual level characteristics.

The Academic Aspiration, Internality and Dependence scales provided fairly consistent but low item correlations with conceptual level, exhibiting trends in the expected directions.

The Study Skills and Organization and Meaning Assimilation scales provided a substantial "mix" of positive and negative item correlations and thus evidenced no consistent relationship to conceptual level characteristics.

In concluding this section it should be noted that the correlation obtained between PCT scores and reading comprehension scores was, as expected, low, positive and non-significant.

Subsidiary Hypothesis H_3

> There is no significant relationship between student CL and student responses to any item on an instructional preference questionnaire.

Of the 14 items comprising this questionnaire, two provided significant correlations with CL. It is therefore debatable as to whether they occurred on the basis of chance or are indeed truly significant. The latter viewpoint has been adopted as this study is concerned with discerning all possible relationships between student CL and instructional preferences; that is, minimizing type II errors. Hypothesis H_3 is therefore rejected.

The IPQ items can be divided into three groups (see Table 24). Items one and two were intended to assess needs for macro-level university structure. Although neither of these items correlated significantly with CL, both evidenced moderate negative correlations. These correlations indicate a trend in the expected direction as Hunt posits a negative correlation between student CL and a student's need for both macro and micro-level institutional structure for effective learning.

The majority of the items comprising this questionnaire (ten) were intended to assess student needs for, and reactions to, structure provided by the Athabasca University learning packages; that is, micro-level needs for structure. Two of these items correlated significantly with CL, and indicate that low CL learners find the use

Table 24

Instructional Preferences Versus CL

	Item No.	Questionnaire Item	Correlations "Normal"	Correlations Partial
Macro-environment	2	I feel that I need help in organizing my studies effectively.	-.20	-.23
	1	I would prefer to contract for a course paced at a speed agreed between myself and the University rather than proceed at my own speed.	-.21	-.21
Micro-environment (Instructional Unit)	7	I listen to the lesson tape before starting the unit to get the "general idea" of the unit first.	.26*	.31*
	5	I find the use of tapes and workbooks confusing and would prefer to use just one method for learning.	-.28*	-.27*
	13	I would prefer important definitions and facts to be supplied in the workbooks.	.23	.25
	3	I prefer essay questions to multiple choice questions.	.22	.18
	6	I follow lesson directions faithfully using the tape and workbook as instructed.	-.20	-.14
	9	I do not use the tape and workbook as directed but use each as I feel the need to.	.13	.12
	10	I find the unit objectives too vague and confusing.	-.16	-.10
	11	I feel that the units do not provide enough examples before I am asked to attempt a question in the workbook.	-.08	-.09
	12	I feel that the units should be clearer on what are the most important facts in the course.	-.05	-.08
	14	I find the units too limited and would prefer more resource information to be supplied with each unit.	.01	.02
Sensory Mode	8	I prefer to learn by reading rather than by listening.	-.18	-.23
	4	I prefer to learn by listening rather than by reading.	.24	.22

* $p < 0.10$

of a visual-aural approach confusing, whereas high CL students utilize the audio-tapes as "advance organizers" before study proper is commenced. If items providing moderate (but non-significant) correlations are taken into account, low CL students may be tentatively described as preferring multiple-choice questions and tending to use the learning package as directed. High CL learners may be tentatively described as preferring essay questions and tending to use the learning package components in a more individualized flexible manner. Replies to item 13 indicate that high CL learners are more in favour of important data being supplied in the workbooks. This finding appears at odds with theoretical expectations as this item would be expected to be more heavily endorsed by low CL rather than high CL students.

Student responses to items 4 and 8 provide tentative indications that CL is associated with the preferred sensory "accessibility channel"; with high CL individuals expressing a preference for learning by listening rather than reading, and vice versa for low CL individuals. This result is interesting as Hunt appears to view sensory preferences and conceptual level as separate learner "accessibility characteristics" (Hunt, 1971).

PART 3: SUMMARY OF RESULTS

Respondents to this study, although not representative of the total nominal population studied were found to bear a marked resemblance to those students actively pursuing their academic studies. It was therefore concluded that the responding group could be regarded as representative of the "real" student population of the total social science course enrollment.

The responding sample was found to contain a majority of low conceptual level or "concrete" students and the obtained CL distribution was found to be similar to that typically obtained from undergraduate populations of "average" North American universities.

Conceptual level was found to be significantly correlated with over 25 percent of the items of an amended version of Biggs' Study Behaviour Questionnaire (Biggs, 1973(b)). The obtained correlations indicated substantive support for the rationale of the questionnaire's Academic Interest, Academic Neuroticism, Fact-Rote Strategy, and Test Anxiety scales with respect to conceptual level characteristics. In addition, tentative support was indicated for the Academic Aspiration, Internality, Dependence, and Openness scales. No clear relationship was indicated between the Study Skills and Organization, and Meaning Assimilation scales and conceptual level.

Finally, correlations obtained between items on an instructional preferences questionnaire and conceptual level provided tentative support for Hunt's model with respect to need for structure at both macro and micro levels of the learning environment.

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[1] Personal correspondence, March 1975.

CHAPTER 6

CONCLUSIONS

In drawing implications from the findings of this study, the following limitations should be borne in mind. First, the study was intended as an exploration of two unknown areas; the relationship between Hunt's construct of conceptual level and study behaviour, and the characteristics of Alberta Open University students enrolled at Athabasca University. Second, the study is not intended to be an experimental one; rather, it is an attempt to investigate some exploratory hypotheses as a preliminary to a systematic study of more definitive hypotheses.

With the above in mind, three major conculsions may be drawn from the findings of this study. First, the active student enrollment of the sampled population appears similar to undergraduate populations at conventional North American universities with respect to the distribution of conceptual level. Second, student "learning styles," as measured by a study behaviour inventory, appear to be significantly related to conceptual level; thus providing tentative support for the relevance of Hunt's matching model for educational practice in unconventional teaching-learning contexts, such as an open university. Third, the relationships obtained between student conceptual level and students' reactions and needs with respect to the structure of their learning environment appear to provide support for the preferential aspects of Hunt's educational matching model. Further, the

findings of this study indicate that the arbitrary categorization of independent study as a "flexible" or low-structured environment requires careful qualification. An appreciation of the educational environment at all levels is necessary for the accurate assessment of any educational treatment in terms of environmental structure.

If the above findings can be assumed to be applicable to the total active open university student population, then Hunt's model has significant implications for the administration and design of Athabasca University's educational services. For example, it is likely that administrative decisions based upon the notion of a "flexible" student population will be inappropriate in view of the large number of "concrete" conceptual level students found. Not only do students vary in their preferences for educational treatment with respect to conceptual level, but they are also likely to express these preferences in their study behaviours and use of the various educational services. Thus it is more appropriate to view students as active co-constructors of their educational environment as opposed to passive recipients of an educational treatment. Matching the student and his educational environment then becomes a matter of providing the student with the opportunity to provide his own match. That is, the role of educational administrator becomes that of a creator of appropriate alternate environments from which the student chooses, to provide the appropriate match (Hunt, 1973; Biggs, 1973(b)).

The findings of this study indicate that at least half of the responding open university students sampled require and prefer a well-structured environment. Thus, it is likely that their learning will be facilitated by simply-structured learning packages and that

the use of interactive visual-aural formats should be approached with caution. At the wider, or macro, environmental level it is likely that a large number of students will require substantial direction from the university and that it may be found advantageous to provide them with specific commitments with respect to course completion and assignments. However, the university will also have to meet the needs of the relatively complex students who are likely to express preferences for less structured options.

Implications and Suggestions for Further Research

The findings of this study are supportive of the general applicability of Hunt's model to an open university population, but they are too generalized for specific recommendations to be made with respect to particular aspects of university services. Nevertheless if, as the findings of the present study indicate, student study behaviours and instructional preferences are related to student conceptual level, then differences in students' needs for educational structure bear further consideration.

In view of the limitations typical of most questionnaire surveys, it is preferable that future studies on this topic utilize additional, more direct techniques. This particular study appears to have been well-responded to in terms of the active student population but suffers from the significant weakness shared by all self-report techniques in that it provides "second-hand" data. That is, the experimenter is unable to view the behaviour directly. However, this chapter would not be complete without a defence of the use of questionnaires for data collection. Although questionnaire surveys

are much maligned as sources of data, they are often the only viable and convenient method of collecting necessary data. In the context of the open university there appears to be a definite place for them in that the basic vehicle for student-university interaction is written correspondence. It would therefore appear reasonable to suppose that under these conditions, such students are likely to respond well to mailed surveys. This appears to be the case in this study where, although only half of the students responded, the responding group appeared highly representative of the active, or real, student population.

Nevertheless, there are significant limitations to self-report techniques and it would appear that more definitive results can be obtained by a judicious mix of unobtrusive and participant observation techniques (Phillips, 1971). In particular, the use of unobtrusive measures such as student records appear most useful in the open university context (Webb et al., 1966). Students' structural needs can be assessed through monitoring their use of tutors, seminars and assemblies, and other informal contacts with the university. Such methods appear far more accurate and efficient, and less troublesome, than administering a psychological test to each student. In addition, it is likely that more meaningful and precise data can be obtained through the use of small-scale pilot projects. For example, a small number of students could be afforded the opportunity to form a contract with Athabasca University with respect to rate of progress through a particular course. Again, a sample of volunteer students could be provided with a local resource person to provide necessary support and direction as required. Also,

students could be allowed to dispense with audio-tapes, using substitute written materials instead.

Such studies as those suggested above have several advantages over the present one: First, they are incorporated in the normal university programme and thus gain in external validity. Second, they provide for economical and practical identification of low and high CL students, as the student categorizes himself by his choice of option. Categorization is thus effected in a manner that is educationally relevant. Lastly, such studies provide for economical and more direct recording of student behaviour, thus eliminating the need for extensive self-report techniques such as those used in the present study.

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APPENDIX A

STUDY BEHAVIOUR QUESTIONNAIRE
(SBQ-JS)

STUDY BEHAVIOR QUESTIONNAIRE

On the following pages are a number of questions about your habitual or usual study methods.

While researchers have been unable to discover one single best method of study, university success is still closely related to your approach to your work. Different people make effective use of widely varying approaches. In order to obtain a comprehensive picture of how you see your own approach, please answer these questions as truthfully as you can. Do not worry about projecting a good image: your responses will be treated as confidential.

Do not spend too long on any one item: your first impression is the most valuable for questions of this kind.

Use the supplied answer sheet. Just fill in your Name and Sex on the top line. Do not bother filling in anything else except your answers. Your answers to the Questionnaire should be marked in Part 1 only, and only the first 78 items require a mark. You should indicate your answer to a question as shown in the example at the top left-hand corner of the answer sheet.

For each question, there corresponds a 5-point scale on the answer sheet, according to the following:

1: This is never or very rarely true of me.
2: This is sometimes true of me.
3: This is true of me about half the time or I cannot decide.
4: This is frequently true of me.
5: This is always or almost always true of me.

Answer each question - if you have difficulties about deciding score '3'. Forget the A's and B's - remember that agreement scores high (4,5); disagreement low (1,2).

A 1 - RARELY TRUE
B 2 - SOMETIMES TRUE
C 3 - MAY OR MAY NOT BE TRUE
D 4 - FREQUENTLY TRUE
E 5 - ALMOST ALWAYS TRUE

1. In choosing between two courses, I put more emphasis on how practical rather than on how interesting a course may be.

2. I usually become increasingly absorbed in my work the more I do.

3. I find a new and unfamiliar approach to an already learned topic confusing and depressing.

4. When I have worked something out for myself and I really believe my view to be sound, I will stick to it if other students or even the instructor clearly disagree with me.

5. I try to do all of my assignments as soon as they are assigned.

6. I think most people can actually learn better when they are given the facts about a topic instead of having to figure them out by themselves.

7. I try to relate new material, as I am reading it, to previously learned material.

8. I worry a lot about how I am going to do when I am studying for a test.

9. I am quite prepared to find that my university studies will raise more questions than they settle.

10. I question the value of undergraduate courses which take a theoretical, academic instead of a practical approach.

11. I have a strong desire to excel in all my studies.

12. I have to be sure of something in my own mind before I will accept it as being valid or true.

13. I try to work consistently throughout the course and review regularly when the exams are close.

14. I learn some things by rote, going over and over them until I know them by heart.

15. I try to relate what I have learned in one subject to that in another.

16. I am discouraged by a poor mark on a test and worry about how I will do on the next test.

A 1 - RARELY TRUE
B 2 - SOMETIMES TRUE
C 3 - MAY OR MAY NOT BE TRUE
D 4 - FREQUENTLY TRUE
E 5 - ALMOST ALWAYS TRUE

17. I expect that my university studies will change my views about such things as politics, my religion, and my philosophy of life.

18. As long as I do well on the examinations, I don't worry much about the particular content of a course.

19. I find most new topics interesting and often spend extra time trying to obtain more information about them.

20. I rarely keep up to date with suggested readings that are meant to keep pace with the units.

21. While I realize that truth is forever changing as knowledge is increasing, I feel compelled to discover what appears to me to be the truth at this time.

22. After a study session, I reread my notes to make sure they are legible and that I understand them.

23. I prefer subjects with a lot of factual content to more theoretical kinds of subjects.

24. In reading new material I often find that I'm continually reminded of material I already know and see the latter in a new light.

25. I think that one important benefit of my university studies will be to give me a more general viewpoint.

26. When writing an essay, I find that the topic rapidly becomes more and more complex and I have great difficulty in tying up all the loose ends at the finish.

27. I believe strongly that my main aim in life is to discover my own philosophy and belief system and to act strictly in accordance with it.

28. I keep neat, carefully arranged notes.

29. I prefer to learn the facts and details about a topic rather than a theoretical understanding of it.

30. I am very aware that lecturers and textbook writers know a lot more than I do and so I rely on their judgment rather than on my own.

A 1 - RARELY TRUE
B 2 - SOMETIMES TRUE
C 3 - MAY OR MAY NOT BE TRUE
D 4 - FREQUENTLY TRUE
E 5 - ALMOST ALWAYS TRUE

31. When I am reading fresh material, I try to think of what I already know that is related to it and frame questions on this basis that the new material may answer.

32. I am concerned about how poor results on a test will affect my overall grade in a course.

33. I find that I am very interested in trying to understand the point-of-view of other students, especially those from different backgrounds than myself.

34. I would rather take a difficult, interesting course instead of an easy, uninteresting course.

35. It is inevitable that at first one's understanding of a subject will be confused, but I find this initial confusion very distressing.

36. What I make of my own life is my own responsibility: I cannot reasonably blame my background, the system, or just sheer bad luck for whatever happens to me.

37. I try to keep up with all of the suggested readings that go with the units.

38. I make a point of studying set readings in detail rather than attempting to cover both required and optional readings.

39. I take seriously anything that I have been taught in my lessons, or that is in my readings so that I would change my interpretations only on the strongest evidence.

40. When I approach a new piece of reading material, I try to note both the basic factual knowledge it contains and the general theoretical points: I rote learn the former, and think about and chew over the latter until both parts complement each other, and the whole hangs together. (Rate yourself according to whether this is a deliberate and conscious strategy.)

41. I feel that formal examinations are a poor method of measuring my knowledge in a course.

42. I think that the university should encourage experimentation and change in our society.

A 1 - RARELY TRUE
B 2 - SOMETIMES TRUE
C 3 - MAY OR MAY NOT BE TRUE
D 4 - FREQUENTLY TRUE
E 5 - ALMOST ALWAYS TRUE

43. I find university more relevant than high school because I am able to study areas which really interest me.

44. When people appear to blame me for something I seriously consider the possibility that they might be right.

45. I summarize suggested readings and include these as part of my notes on a topic.

46. I don't spend time on learning things that I know won't be asked in the exams.

47. I would question the statements and ideas of my instructors only under special circumstances.

48. While I am studying, I often think of real life situations in which the material that I am learning would be handy, and useful to know.

49. I feel that most tests examine material beyond that which I should reasonably be expected to know.

50. I believe that in university courses a student should be exposed to all kinds of political and social viewpoints.

51. I find that I have to do enough work on a topic so that I can form my own point-of-view before I am satisfied.

52. I prefer instruction that follows the course outline, rather than that which goes off the topic.

53. I find I personally have to see a cooperative venture (say a group project) through to the end rather than delegate responsibility to a colleague.

54. I try to anticipate exam topics and questions and use these as study guides.

55. I prefer to write term papers or essays which answer specific questions rather than cover general topics.

56. I feel that virtually any topic can be highly interesting once I get into it.

57. I feel that I might have some power, eventually, to change things in the world that I see now to be wrong.

A 1 - RARELY TRUE
B 2 - SOMETIMES TRUE
C 3 - MAY OR MAY NOT BE TRUE
D 4 - FREQUENTLY TRUE
E 5 - ALMOST ALWAYS TRUE

58. When a test has been marked, I go over it carefully correcting all errors and trying to understand why I made the original mistakes.

59. I prefer to accept what my instructors say even though it sometimes means that I have to change my own ideas.

60. I find that discussing a new topic with someone who is familiar with it often helps me understand it better.

61. I worry that an instructor will try and trick me on a test even though I know the material well.

62. I try to select my courses on the basis of their practical value for my career plans rather than for their academic interest.

63. I spend a lot of my free time finding out about interesting topics which have been discussed in different classes.

64. I think that it is unreasonable for an instructor to expect completely original work from an undergraduate student.

65. When I have come to an important conclusion, I feel an overpowering urge to convince other people that it is right.

66. I keep reviewing important topics until I understand them completely.

67. I prefer a text which lays things out carefully in point form and contains frequent tables and summaries, to one which is written almost entirely in paragraph form.

68. I prefer texts which present a unified point of view and are written by an authority instead of a collection of articles by various authors on a topic.

69. Even when I have studied hard for a test, I worry that I may not be able to do well on it.

70. I believe that an instructor has the right to expound any viewpoint he wishes as long as he is sincere in doing so.

71. I find that studying academic topics can at times be as exciting and gripping as reading a good novel.

A 1 - RARELY TRUE
B 2 - SOMETIMES TRUE
C 3 - MAY OR MAY NOT BE TRUE
D 4 - FREQUENTLY TRUE
E 5 - ALMOST ALWAYS TRUE

72. "Inner certainty" is more important to me than modifying my views to fit more easily with what other responsible people think.

73. I find that the most worthwhile summaries of material are those which I prepare myself rather than those that I take out of textbooks.

74. I find that most seminar discussions are a waste of time because they usually refer to opinions rather than to hard facts.

75. I feel that it is unfair to include material in tests which has not been covered in the required text.

76. When I find that an assigned reading is too difficult, I try to find a less rigorous treatment and then return to the original one later.

77. I believe that an instructor has the right to critically discuss controversial questions although this may offend some.

78. I feel that one of the most important considerations in choosing a course is whether or not I will be able to get top marks in it.

APPENDIX B

PARAGRAPH COMPLETION EXERCISE
(PCT)

Paragraph Completion Exercise

There are no strict rules for this exercise. Just bear the following points in mind when you attempt this exercise:

1. Write a short paragraph to complete the given phrase for each item.

2. Just write down the thoughts that come immediately to mind for each item.

3. Don't spend too long on each item; two to three minutes for each item is sufficient.

Complete the following words or phrases in two or three sentences--or more if you feel this is necessary.

1. "Rules . . . "

2. "When I am in doubt . . . "

3. "Confusion . . . "

4. "Parents . . . "

5. "When I am criticized . . . "

6. "When others criticize me it usually means . . . "

APPENDIX C

READING COMPREHENSION TEST

Name . . . . . .

COMPREHENSION

DIRECTIONS: This test consists of a series of passages on different topics. Each passage is followed by several questions. These questions concern the main ideas in the passages, important facts which are given, the order of events, and conclusions you can reasonably draw from the ideas in the passages. *Please read each passage and then try to answer the questions which follow it.* If you do not remember the answer to a question, you may reread the passage to find it, but you will be able to complete the test more rapidly if you read carefully enough to answer the questions at once.

THE ANSWERS ARE TO BE RECORDED IN THIS BOOKLET; you are to choose the once of the four possible answers to each question that is correct, and place a check mark in the parentheses at the right of the answer you have chosen. Study the following example:

Sample: The main idea of paragraph 1 in *Directions* is that:

(1) this is a test of vocabulary . . . . . ( )
(2) you are to read passages and answer questions on their meanings . . . . . (✓)
(3) you are to read each passage more than once . . . . . ( )
(4) this is a test to see how rapidly you can read . . . . . ( )

It will be helpful to us if you will also time yourself on this test and indicate below the total time in minutes that it took you to complete the test from start to finish.

Time taken = ... minutes

THE INDUSTRIAL CHANGE GOES ON

ADVENT OF THE FACTORY. The Industrial Revolution has helped to increase our productivity. But what is more important, it has revolutionized the *lives* of people. From the very moment that hand-made goods gave way to machine-made articles, the old ways of living were ended. Even the first machines, although they weren't as intricate as ours today, were too big to fit in the front room of a cottage. They cost something to make, too. What was the result? A lot of machines were put in one building near a waterfall, and the people who once made goods by hand flocked to the factories to work. So began the factory system with which we are all familiar.

HOW CITIES BECAME SO BIG. The workers had to live near the factory. Cities grew up. For instance, in the United States at the time this country was founded, the largest cities--Philadelphia, Boston and New York--had only a few thousand people. But because of the changes wrought by manufacturing methods, there came greater and greater concentrations of people, until today over half of our population dwells in urban areas.

And with the mushroom growth of our cities came the unplanned, unsanitary, and unsightly slums. Wages were low, hours were long, and factories were unsafe and unclean. The Industrial Revolution brought problems as well as the hope for plenty.

1. The main idea of the first paragraph is that

   (1) the machines introduced by the Industrial Revolution were too large to fit into the front rooms of cottages . . . ( )
   (2) the Industrial Revolution substituted machine-made articles for handmade goods . . . . . ( )
   (3) the Industrial Revolution not only increased productivity but brought new ways of living . . . . . ( )
   (4) the Industrial Revolution did much to increase productivity . . . . . ( )

2. The main idea of the second paragraph is that

   (1) largely because of the factory system more than half of our population lives in cities . . . . . ( )
   (2) the cities of today are far too big . . . . . ( )
   (3) because of changes in manufacturing methods factories have become unsafe and unclean . . . . . ( )
   (4) Philadelphia, Boston and New York are our leading manufacturing cities . . . . . ( )

3. People did not set up machines in their cottages because of ( )
   (1) unsightliness . . . . . ( )
   (2) intricacy of their construction . . . . . ( )
   (3) pride in hand work . . . . . ( )
   (4) size and cost . . . . . ( )

4. The machines were put into a building by a waterfall because
   (1) the force of falling water ran the machines . . . . . ( )
   (2) electric power from the falls ran the machines . . . . . ( )
   (3) pure drinking water was scarce . . . . . ( )
   (4) there were few large buildings other than old mills . . . . ( )

5. The rapid development of cities brought
   (1) the Industrial Revolution . . . . . ( )
   (2) a return to old ways of living . . . . . ( )
   (3) the factory system . . . . . ( )
   (4) slums . . . . . ( )

HOW ALEXANDER WON HIS WAR STEED

Philonicus brought the horse Bucephalas to Philip, offering to sell him for thirteen talents; but when they went into the field to try him, they found him so very vicious and unmanageable, that he reared up when they endeavoured to mount him.

They were leading him away as wholly useless and untractable, when Alexander, who stood by, said, "What an excellent horse do they lose, for want of address and boldness to manage him!"

"Do you reproach," said Philip to him, "those who are older than yourself, as if you knew more, and were better able to manage him than they?"

"I could manage this horse," replied he, "better than others do."

"And if you do not," said Philip, "what will you forfeit for your rashness?"

"I will pay," answered Alexander, "the whole price of the horse."

At this the whole company fell a laughing; and as soon as the wager was settled amongst them, he immediately ran to the horse, and taking hold of the bridle, turned him directly toward the sun, having observed that he was afraid of the motion of his own shadow; then letting him go forward a little, and stroking him gently when he found him begin to grow eager and fiery, he let fall his upper garment softly, and with nimble leap securely mounted him, and when he was seated drew in the bridle, and curbed him without either striking or spurring him. Presently, when he found him free from all rebelliousness and only

impatient for the course, he let him go at full speed, inciting him now with a commanding voice, and urging him also with his heel.

Philip and his friends looked on at first in silence and anxiety for the result, till seeing him turn at the end of his career and triumphing for what he had performed, they all burst into acclamations of applause; and his father shedding tears, it is said, for joy, kissed him as he came down from his horse, and in his transport, said, "O my son, look thee out a kingdom equal to and worthy of thyself, for Macedonia is too little for thee."

6. The main idea of the whole passage is that

(1) Bucephalus was a horse hard to manage . . . . . ( )
(2) Philonicus played a trick on Philip by trying to sell him an unmanageable horse . . . . . ( )
(3) Alexander showed that Bucephalus could not be kept in a small country like Macedonia . . . . . ( )
(4) Alexander proved his horsemanship . . . . . ( )

7. The main idea of the last paragraph is that

(1) Alexander's father shed tears over the event . . . . . ( )
(2) the people watching Alexander applauded him . . . . . ( )
(3) anxiety turned to joy at Alexander's success . . . . . ( )
(4) Alexander came to the end of his career . . . . . ( )

8. When Alexander rode

(1) he used his voice and heel to urge Bucephalus on . . . . . ( )
(2) he brought the horse out of the bright sunlight . . . . . ( )
(3) he found Bucephalus too impatient to learn easily . . . . . ( )
(4) he gave the horse a few gentle strokes with his riding stick . . . . . ( )

9. When the ride was over

(1) Alexander no longer had to work for a living . . . . . ( )
(2) Alexander's father said his son was too good for Macedonia . . . . . ( )
(3) Alexander's father drove him from the kingdom . . . . . ( )
(4) Alexander's father greeted him from his transport plane . . ( )

10. A conclusion which can be drawn from this passage is that

(1) Alexander's father was proud of him . . . . . ( )
(2) good horsemen make good kings . . . . . ( )
(3) Bucephalus was an unusually intelligent horse . . . . . ( )
(4) Philip and his friends were cowards . . . . . ( )

MARS, OBJECT OF SPACE PROBE

If you saw a brilliant star in the sky shining with a distinct reddish or orange red light, it would be Mars. Earth's neighbor planet. Because it is red, a color which has always been associated with war and destruction, this planet was named after Mars, the great god of war. Mars, legendary father of the Romands through his son Romulus--founder of Rome--according to ancient myths was highly honoured and worshiped as the god of the blood red battle field.

Astronomers have been especially interested in Mars. When at the point in its orbit nearest the earth, it is only 48.6 million miles away and clearly visible to the unaided eye. Through a telescope it appears as a broad red globe resembling a fiery orange. At the poles patches of white are seen. This has led some astronomers to believe that the poles are covered with ice and snow. The rest of the surface of Mars has a reddish color except for dark greenish-blue patches. Markings which appear to be definite lines are also seen on this planet. These lines are spoken of as "canals," and their arrangement has led some astronomers to wonder whether they were not built by beings similar to ourselves.

Mars has two moons, one of which travels so fast in its orbit that it goes around the plant three times each day. It rotates on its axis once in 24 hours and 37 minutes, making a day there just 37 minutes longer than a day on earth.

Photographs sent back to Earth by Mariner IV have not completely climinated the possibility of biological life on Mars. The space probe has sustained the possibility of water vapor, seasonal changes in vegetation and polar ice caps. Evidently the mean temperature of the red planet differs very little from that of Earth's Antarctica. Dr. Norman H. Horowitz of the California Institute of Technology points out that there are microbes and some flowering plants living in the cold climates of the Antarctic. However, other scientists doubt the existence of life because of lack of oxygen, scarcity of water, low atmospheric density and bombardment by solar and cosmic rays. Dr. Horowitz reminds us that plants and animals can and do adapt to hostile conditions. Thus the argument goes on regarding life, as we know it, on Mars. The final answer may depend upon information from future space probes.

11. The main idea of the first paragraph is that

(1) Mars is a planet named after the Roman God of War . . . . . ( )
(2) Mars is a reddish planet which can be seen with the naked eye . . . . . ( )
(3) Mars is a largely reddish planet whose colors and markings are of special interest to astronomers . . . . . ( )
(4) Mars is a white planet with red poles, greenish-blue patches, and probably man-made canals . . . . . ( )

12. The main idea of the last paragraph is that

(1) the possibility of life on Mars has not been climinated by space probes . . . . . ( )
(2) the temperature of Antarctica is warmer than the average temperature of Mars . . . . . ( )
(3) the space probes have proved that life does not exist on Mars . . . . . ( )
(4) there can be no life on Mars because of the lack of oxygen and water . . . . . ( )

13. The patches of white on Mars are thought by some astronomers to be

(1) clouds of white vapor and gas . . . . . ( )
(2) snow covered mountain peaks . . . . . ( )
(3) snow covered poles . . . . . ( )
(4) the north pole of Mars . . . . . ( )

14. One of the moons of Mars travels around the planet three times in a

(1) year . . . . . ( )
(2) month . . . . . ( )
(3) week . . . . . ( )
(4) day . . . . . ( )

15. Astronomers could determine the length of a day on Mars by noting the

(1) changing location of its poles . . . . . ( )
(2) speed with which the moons of Mars revolve around it . . . . ( )
(3) time it takes for Mars to rotate on its axis . . . . . ( )
(4) time it takes for the moons to go around Mars . . . . . ( )

CHANGES IN AGRICULTURE

The great industrial changes brought on by the development of machinery have greatly affected American agriculture. After 1865 agriculture became more commercialized; the farmer obtained many of the things he needed from manufacturing centres. The farm area greatly increased, and prior to 1914 farm products were the most important part of the export trade. This was true especially in the period of the 1880's and 1890's, when farm surpluses were sent abroad to pay for our imports.

THE NEW AGRICULTURE. Following the War between the North and the South, agriculture had to undergo considerable change. The farmer, during the colonial period, produced largely for a home market, and the farm was usually a self-sufficient unit. Nearly all of the food, wearing apparel, and other materials needed by the farmer and his family were produced either on the farm or in the local community. After the war, however, the farmer produced more crops to be sold in other parts of the

nation and in foreign countries. Farming had become more of a commercial enterprise. The farmer harvested his crop and produced his products not for himself alone, but also for the rest of the world.

This change came about largely because of the rise of the industrial system, which built up factories in large cities whose population had to get most of its food supply from the farmer, while the manufacturing centres produced machinery and other products which the farmer bought.

16. The main idea of the first paragraph is that

(1) the great industrial changes brought on by the development of machinery have greatly affected American agriculture . . . . . ( )
(2) by 1914 farm products had become the most important part of America's export trade . . . . . ( )
(3) the period of the 1880's and 1890's saw a tremendous increase in the export of farm products . . . . . ( )
(4) in the 1880's and 1890's, especially, American agriculture was greatly expanded by activities in the foreign market . . . . . ( )

17. The main idea of the second paragraph is that

(1) during the colonial period, farms were usually self-sufficient units . . . . . ( )
(2) after the War between the North and South, most of the farmers' crops were sold . . . . . ( )
(3) following the War between the North and South, agricultural methods were greatly changed . . . . . ( )
(4) after 1865, the farmer changed from a producer for a home market to a producer for both home and world markets . ( )

18. The growth of industry and cities brought about

(1) great industrial changes . . . . . ( )
(2) a need for more food and wearing apparel . . . . . ( )
(3) expansion of farmers' markets . . . . . ( )
(4) self-sufficiency for farms . . . . . ( )

19. The needs of the colonial farmer were fulfilled by

(1) commercial enterprises in the cities . . . . . ( )
(2) his farm and local community . . . . . ( )
(3) the foreign market . . . . . ( )
(4) the home market . . . . . ( )

20. The growth of cities in America

(1) created both goods and a market . . . . . ( )
(2) produced a need as well as self-sufficiency . . . . . ( )
(3) forced a foreign market for farm goods . . . . . ( )
(4) caused the neglect of the local community . . . . . ( )

APPENDIX D

INSTRUCTIONAL PREFERENCES QUESTIONNAIRE

Instructional Preferences

I would like you to carefully consider your experiences so far with our Social Science learning packages.

There is a five-point scale at the right of each item. Circle the scale number that most nearly reflects your own position, as follows:

1: This is rarely, or not at all, true for me.
2: This is only slightly, or sometimes, true for me.
3: This is half-true for me or I cannot decide.
4: This is frequently, or fairly, true for me.
5: This is almost always, or very, true for me.

Circle only one number for each item--if you have difficulties about deciding, score "3".

INSTRUCTIONAL PREFERENCES

A 1 - RARELY TRUE
B 2 - SOMETIMES TRUE
C 3 - MAY OR MAY NOT BE TRUE
D 4 - FREQUENTLY TRUE
D 5 - ALMOST ALWAYS TRUE

1. I would prefer to contract for a course paced at a speed agreed between myself and the University rather than proceed at my own speed	1	2	3	4	5
2. I feel that I need help in organizing my studies effectively	1	2	3	4	5
3. I prefer essay questions to multiple choice questions	1	2	3	4	5
4. I prefer to learn by listening rather than by reading	1	2	3	4	5
5. I find the use of tapes and workbooks confusing and would prefer to use just one method for learning	1	2	3	4	5
6. I follow lesson directions faithfully, using the tape and workbook as instructed	1	2	3	4	5
7. I listen to the lesson tape before starting the unit to get the "general idea" of the unit first	1	2	3	4	5
8. I prefer to learn by reading rather than by listening	1	2	3	4	5
9. I do not use the tape and workbook as directed, but use each as I feel the need to	1	2	3	4	5
10. I find the unit objectives too vague and confusing	1	2	3	4	5
11. I feel that the units do not provide enough examples before I am asked to attempt a question in the workbook	1	2	3	4	5
12. I feel that the units should be clearer on what are the most important facts in the course	1	2	3	4	5
13. I would prefer important definitions and facts to be supplied in the workbooks	1	2	3	4	5
14. I find the units too limited and would prefer more resource information to be supplied with each unit	1	2	3	4	5